



# ***Death in the line of duty...***

**NIOSH**  
Fire Fighter Fatality Investigation  
and Prevention Program

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A summary of a NIOSH fire fighter fatality investigation

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March 5, 2012

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## ***Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa***

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### **Executive Summary**

On September 18, 2011, a 41-year-old male volunteer fire fighter (the victim) lost his life while directing traffic at a motor vehicle collision on an interstate highway. The victim responded to the scene in the department's rescue truck to establish a traffic incident management area (TIMA) while an ambulance crew from his department checked on vehicle occupants involved in the collision. After establishing and repositioning the TIMA, the victim positioned himself in the left lane ahead of the TIMA to direct oncoming motorists to the right lane. The victim was struck while standing on the left shoulder/left lane when a motorist swerved to the left from the right lane of travel to avoid hitting a vehicle in the right lane. The victim was pronounced dead on the scene.



**View of the eastbound travel lanes, where incident occurred, from nearby overpass.  
(NIOSH photo.)**

### **Contributing Factors**

- *Insufficient training, staffing, equipment, and standard operating procedures to adequately establish a traffic incident management area to protect emergency responders and provide advanced warning to approaching motorists*
- *Victim working in a travel lane outside of the established traffic incident management area*
- *Lack of established pre-incident plans and agreements regarding traffic control incident management at roadway incidents with agencies responsible for responding to roadway incidents*
- *Inattentive motorist.*

### **Key Recommendations**

- *Fire departments should ensure that emergency responders receive proper training and have adequate staffing, sufficient equipment, and appropriate procedures in place for responding to*

## Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa

*and operating at a roadway emergency incident*

- *Fire departments should ensure that standard operating procedures/guidelines include guidance on identifying and maintaining a safe location while working in or near moving traffic*
- *Fire departments should establish pre-incident plans and agreements regarding traffic control incident management at roadway incidents with other public safety agencies (e.g., fire departments, EMS, and law enforcement), local/state departments of highways, and private sector responders.*
- *Motorists should be attentive at all times while operating a motor vehicle, especially when approaching and driving through a traffic incident management area, so that they avoid striking emergency responders, other vehicles, and/or traffic control devices.*



**Aerial view of section of interstate where incident occurred.**  
(Adapted from Google Earth® satellite image.)

The National Institute for Occupational Safety and Health (NIOSH), an institute within the Centers for Disease Control and Prevention (CDC), is the federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. In 1998, Congress appropriated funds to NIOSH to conduct a fire fighter initiative that resulted in the NIOSH "Fire Fighter Fatality Investigation and Prevention Program" which examines line-of-duty-deaths or on duty deaths of fire fighters to assist fire departments, fire fighters, the fire service and others to prevent similar fire fighter deaths in the future. The agency does not enforce compliance with State or Federal occupational safety and health standards and does not determine fault or assign blame. Participation of fire departments and individuals in NIOSH investigations is voluntary. Under its program, NIOSH investigators interview persons with knowledge of the incident who agree to be interviewed and review available records to develop a description of the conditions and circumstances leading to the death(s). Interviewees are not asked to sign sworn statements and interviews are not recorded. The agency's reports do not name the victim, the fire department or those interviewed. The NIOSH report's summary of the conditions and circumstances surrounding the fatality is intended to provide context to the agency's recommendations and is not intended to be definitive for purposes of determining any claim or benefit.

For further information, visit the program Web site at [www.cdc.gov/niosh/fire](http://www.cdc.gov/niosh/fire) or call toll free 1-800-CDC-INFO (1-800-232-4636).

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## **Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa**

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### **Introduction**

On September 18, 2011, a 41-year-old male volunteer fire fighter (the victim) lost his life while directing traffic at an interstate highway incident. On September 19, 2011, the U.S. Fire Administration notified the National Institute for Occupational Safety and Health (NIOSH) of this incident. On October 4 – 7, 2011, a safety and occupational health specialist from the NIOSH Fire Fighter Fatality Investigation and Prevention Program traveled to Iowa to investigate this incident. The NIOSH investigator met with and interviewed the fire chief, fire department members involved with the incident, Iowa State Patrol (ISP) investigators, the county sheriff, and 911 center personnel.

The NIOSH investigator visited, documented, and photographed the incident scene. The NIOSH investigator also documented and photographed similar personal protective equipment (PPE) worn by the victim, fire/EMS apparatus involved with the incident, and the department's traffic control devices. The NIOSH investigator reviewed training records for the victim, dispatch radio transcripts and audio recordings for the incident, and standard operating guidelines (SOGs) of the fire department. The NIOSH investigator also reviewed the ISP final investigative report and medical examiner report.

### **Fire Department**

At the time of this incident, this rural volunteer fire and EMS department operated out of a single fire station with 22 active members serving a population of over 1,300 within an area of about 90 square miles. The fire department had three engines (one not in service), a rescue truck, a grass truck, and an ambulance.

The fire department obtained operating funds through ambulance billing, donations, and township taxes. This department responded to an average of 90 calls a year with an average of 10 of these calls being related to a motor vehicle collision. The fire chief is the only position within the department that receives a yearly stipend.

At the time of the NIOSH investigation, the fire department had established SOGs dating back to 2009, covering numerous administrative and operational functions. These SOGs contained two individual SOGs related to this incident, titled "Vehicle Accidents" and "Automobile Accidents." The department's SOG on vehicular accidents<sup>1</sup> (dated 11/1/2009) provided pertinent information such as the following:

- Personnel exposed to vehicular traffic shall wear reflective clothing.
- Personnel shall work in teams.
- Personnel on-scene shall remain alert for safety and health hazards such as vehicular traffic.
- All hazards shall be reported to the safety officer. *Note: A safety officer was not assigned to this incident.*
- If adequate staffing is not available request mutual aid.
- Apparatus shall be staged at a safe location, at least 50 feet from vehicle.
- When possible, position to protect personnel from on-coming traffic.
- When possible, point apparatus away from the incident.

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## ***Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa***

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- Establish scene control and security. Establish traffic control as required by the situation/location. Request assistance from law enforcement as required.
- Command shall size-up the situation to identify priorities and tactics.

The department's SOG on automobile accidents<sup>1</sup> (dated 11/1/2009) provided pertinent information such as the following:

- The officer in charge must provide safe apparatus positioning for fire/EMS crews and the accident scene.
  - Position apparatus at least 100 feet from the accident scene. If traffic conditions warrant, traffic lanes shall be shut down until a scene survey can be completed and the scene is deemed safe by the officer in charge.
  - Apparatus may be repositioned after the scene survey is complete and hazards are identified or under control.
- Any auto accident scene that will require traffic control will be at the discretion of the officer in charge or the incident commander.
  - If no police personnel are on the scene and manpower permits, fire department or EMS personnel may assist in traffic control until a police unit arrives on the scene. At that time, traffic control will be turned over to the police agency.
  - If no police units are on the scene and manpower is limited, traffic shall be stopped until the rescue/suppression activities are complete and the incident commander feels it is safe to let the traffic resume. If a fire fighter is available at this time, he/she can assist with traffic control.
- An overall survey of the incident shall be performed by the officer in charge and will include but not be limited to the following:
  - Positioning of apparatus
  - Control traffic as required
  - Perform scene survey
  - Stabilize vehicle(s) as required
  - Initiate the incident command system
  - Secure the vehicle
- When arriving on the scene of an auto accident with no apparent hazards, the officer shall:
  - Position apparatus
  - Control traffic
  - Complete a scene survey
  - Stabilize vehicles
  - Provide EMS services or assistance required
- To stop any unsafe action that is taking place or about to take place the term "STOP/FREEZE" commands all persons to stop and correct the unsafe action.
- Rescue vehicles should be used when necessary to block or reroute traffic to insure patient and rescue personnel safety.



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## **Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa**

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- If necessary, fire apparatus shall be parked behind the accident, with their warning lights in operation, in each lane as necessary to insure that a civilian vehicle approaching the scene from the rear cannot hit the accident vehicles or patients.
- If necessary, fire apparatus will be placed in any oncoming lanes of traffic, with their headlights off and their warning lights in operation, to prevent oncoming civilian vehicles from hitting the accident vehicles, the EMS unit, or any rescue personnel working with the accident vehicles or patients.
- Law enforcement officers shall be used for traffic control unless otherwise deemed necessary by the incident commander.
- Warning signs, flares, or other devices shall be placed at least 500 feet before and after the accident scene to warn motorists of scene. (This will be a law enforcement function unless law enforcement personnel are not available.)

*Note: The above listed information was obtained by reviewing two separate SOGs and may not include all information listed within the SOGs. The NIOSH investigator has transcribed the exact language of the SOGs into this report.*

Although these SOGs provide guidelines of what should be done at a vehicle incident scene they do not provide sufficient guidance on how to safely and adequately establish a temporary traffic control zone. Neither the fire department, law enforcement agencies, mutual aid departments, nor state highway department had established agreements or defined responsibilities on how to safely respond to, operate within, and leave an interstate highway incident scene.

### **Training and Experience**

The victim had been with this department for approximately two years with no previous fire/EMS experience. The victim was promoted to the rank of equipment captain in June 2011. He held certifications in Fire Fighter I, Hazardous Materials Operations, Defensive Driving, and Cardiopulmonary Resuscitation. He had also completed the online course *IS-100 Incident Command System* offered through the Federal Emergency Management Agency's Emergency Management Institute. The victim had not taken any courses related to working at a highway incident. No additional training records were available.

The IC, at the time of the incident, had been with this department for approximately 30 years, holding the current rank of president. He held certifications in Fire Fighter II, Emergency Medical Technician – Basic (EMT-B), Hazardous Materials Operations, Defensive Driving, and Cardiopulmonary Resuscitation. He had also completed the online courses *IS-100 Incident Command System* and *IS-700 National Incident Management System (NIMS) An Introduction* offered through the Federal Emergency Management Agency's Emergency Management Institute.

The fire department did not have a training program established to provide information on how to safely respond to a highway incident, how to correctly position on scene apparatus, what traffic control devices should be used, how to deploy these devices, and how to take down the temporary traffic

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## **Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa**

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control zone. The fire department was unaware of any training programs associated with the state fire service training bureau regarding highway incident safety.

### **Equipment and Personnel**

All apparatus responded with emergency lights and siren to check on a minor injury following a motor vehicle collision on an interstate highway. The victim's department initially responded with four personnel in their ambulance (operator, fire fighter, medic, and EMT). The victim responded in the department's rescue truck to provide traffic control if needed.

The rescue truck contained three cones and a portable collapsible sign for establishing a temporary traffic control zone to protect workers during an incident and alert motorists of a highway incident. The cones were orange with one having reflective markings. The cones measured 28 inches tall with a 14-inch square base (see Photo 1). The portable collapsible sign was retro-reflective fluorescent pink measuring approximately 6 feet tall (on a stand) with a 48-inch diamond-shaped design. The sign contained 1¼-inch black trim around the edges with black 7-inch by 4-inch lettering that stated, "Emergency Scene Ahead" (see Photo 2). The manufacturer of this product affixed a label noting that the sign met applicable conditions related to the *National Cooperative Highway Research Program Report 350: Recommended Procedures for the Safety Performance Evaluation of Highway Features*.<sup>2</sup>



**Photo 1. Cone used at the incident scene.  
(NIOSH photo.)**



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**Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa**

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**Photo 2. Emergency sign used at the incident scene.**  
*(NIOSH photo.)*



## ***Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa***

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The 2008 ambulance was equipped with red, white, and amber emergency warning lights (see Photo 3). The 2006 rescue truck was equipped with red, white, and blue emergency warning lights and a single, rear amber directional arrow sign (see Photo 4). According to interviews conducted by the NIOSH investigator, all emergency warning lights were activated on each vehicle, including the directional arrow sign on the rescue truck, when the victim was struck. Only one apparatus within the department's fleet had been marked with rear chevrons according to NFPA 1901 *Standard for Automotive Fire Apparatus*.



**Photo 3. Rear of ambulance.**  
*(NIOSH photo.)*



**Photo 4. Rear of rescue truck.**  
*(NIOSH photo.)*



## ***Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa***

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### **Timeline**

This timeline is provided to set out, to the extent possible, the sequence of events according to recorded and intelligible radio transmissions. Times are approximate and were obtained from review of the dispatch records, witness interviews, and other available information. Times have been rounded to the nearest minute. NIOSH investigators have attempted to include all intelligible radio transmissions, but some may be missing. This timeline is not intended, nor should it be used, as a formal record of events.

- **1809 Hours**  
County 911 center received a cellular 911 call from an off-duty state trooper stating there had been a motor vehicle collision (property damage only) on said interstate highway.
- **1812 Hours**  
County 911 center received a second 911 call from the off-duty state trooper requesting a rescue unit respond to the incident to check on a minor injury.
- **1813 Hours**  
The County 911 center dispatched the victim's department and notified Iowa State Patrol (ISP) of the motor vehicle collision.  
ISP dispatched a single trooper to the incident.
- **1816 Hours**  
Ambulance from victim's department marked en route.
- **1819 Hours**  
The victim marked en route in the rescue truck.
- **1820 Hours**  
Ambulance marked on scene and the driver took command of the incident.
- **1822 Hours**  
The victim marked on scene.
- **1824 Hours**  
The IC radioed dispatch to check on the location of law enforcement.  
County 911 center advised the IC that ISP had been advised of the incident.
- **1826 Hours**  
911 center advised the IC that ISP was en route.

## Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa

- **1832 Hours**  
The ISP trooper arrived on the scene.
- **1848 Hours**  
IC advised the County 911 center that a fire fighter was down.  
County 911 center received a cellular 911 call from a motorist stating a person had been struck by a vehicle and had been fatally wounded.
- **1850 Hours**  
The ambulance medic requested additional traffic control.

### Personal Protective Equipment

Fire department personnel reported to the NIOSH investigator that the victim was wearing his issued structural fire fighting ensemble (bunker pants and coat) and a 5-point break-away, high-visibility retro-reflective vest; the victim was also wearing a non-issued ball cap and sun glasses. *Note: Due to the unknown location of the victim's gear following the incident, the NIOSH investigator could not document its condition.* The fire chief of the department provided the NIOSH investigator with a vest and

set of structural gear that were similar to what the victim was wearing at the time of the incident. The vest contained a label sewn into the vest stating it was compliant with ANSI 107-2004<sup>3</sup> as a class 2, level 2 high-visibility garment. The vest was lime-green, with nonreflective orange striping and 3M Scotchlite® striping over the shoulders, chest, back, and midsection (see Photo 5). The turnout gear, documented by the NIOSH investigator, had 3-inch standard yellow-green/silver striping. The turnout coat had two sets of stripes on each arm and a stripe around the coat bottom and mid chest (see Photo 6). The bunker pants had a stripe at the bottom of each leg cuff (see Photo 7).



**Photo 5. Vest similar to one worn by the victim.**  
(NIOSH photo.)

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**Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa**

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**Photo 6. Turn out coat similar to one worn by the victim.**  
(NIOSH photo.)



**Photo 7. Bunker pants similar to those worn by the victim.**  
(NIOSH photo.)



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## ***Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa***

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The fire chief advised the NIOSH investigator that each department member had been issued a 5-point break-away, high-visibility retro-reflective vest and two spare vests had been placed on each response apparatus in case members forgot to grab their vests. Personnel on the ambulance did not grab their issued PPE (e.g., turnout gear, helmet, or 5-point break-away, high-visibility retro-reflective vest) before responding to the incident due to initial information received on the incident. *Note: They did not originally believe that the incident was on the interstate highway.*

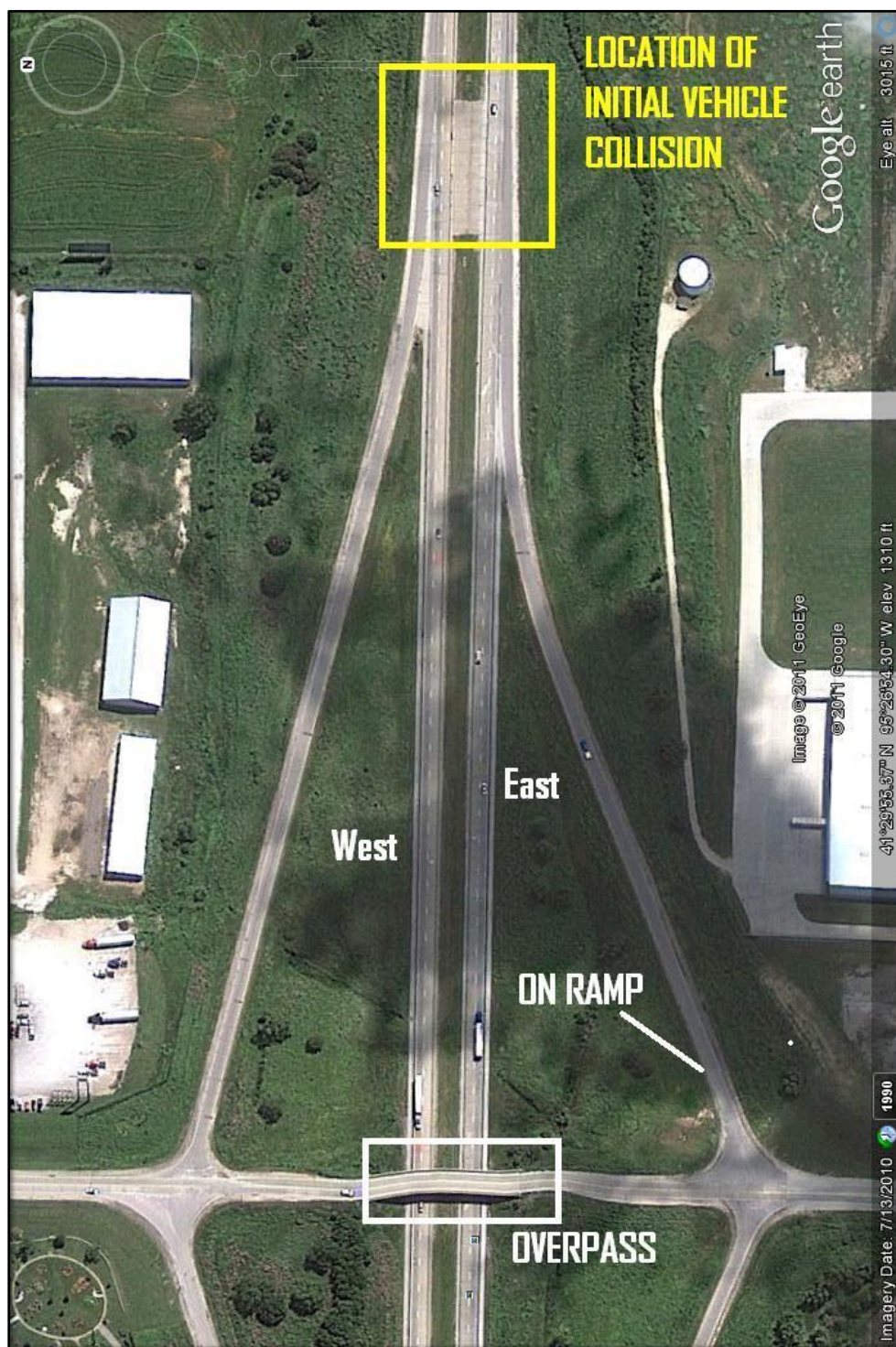
### **Weather and Road Conditions**

The initial and fatal incident occurred within the eastbound passing lane of a four-lane (paved) divided (by grass median) interstate highway. The posted speed limit was 70 mph. The state of Iowa does have laws pertaining to “slow down, move over” and no texting while operating a motor vehicle. Weather is not believed to have been a factor in this incident.

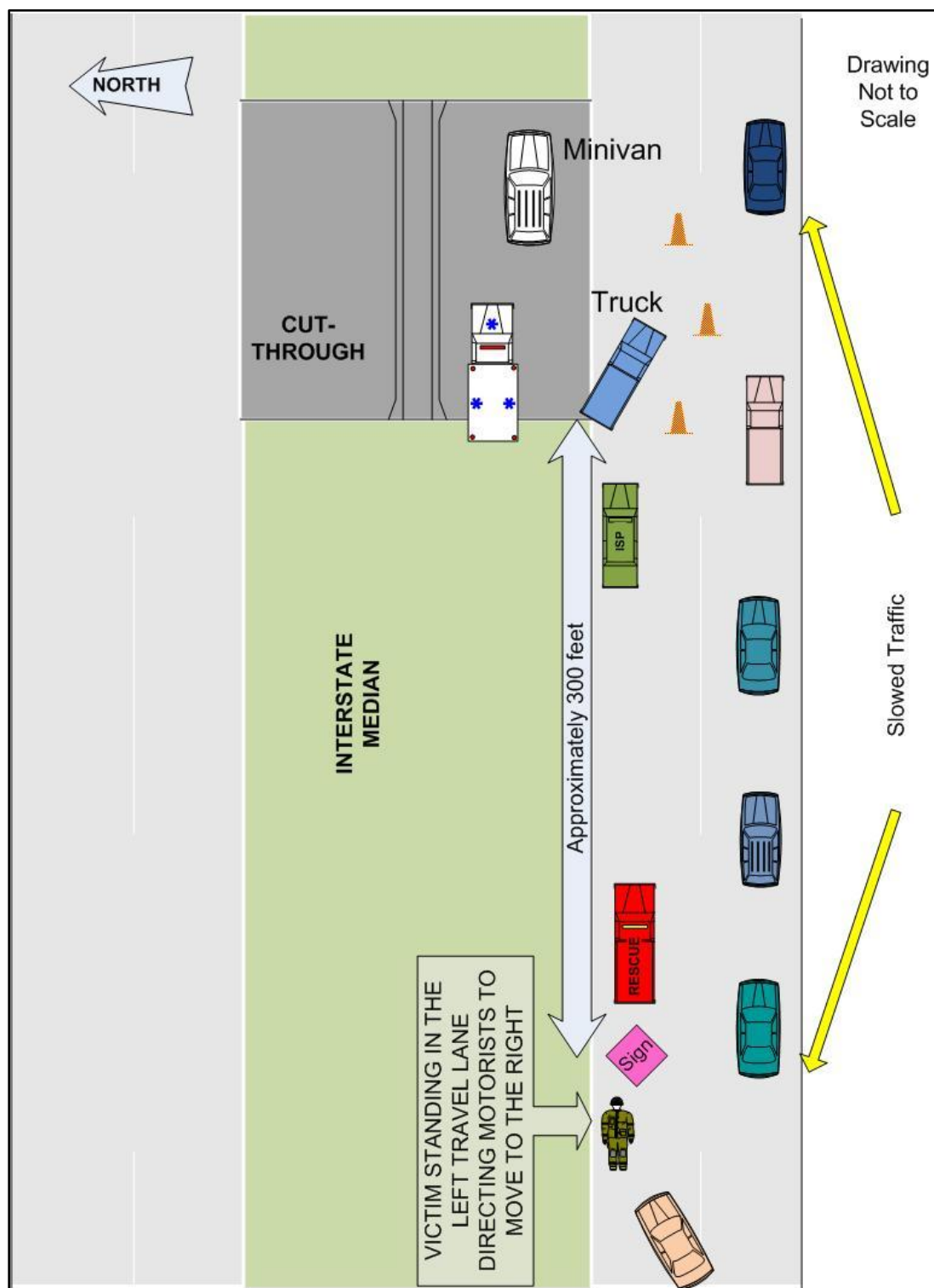
### **Investigation**

On September 18, 2011, a 41-year-old male volunteer fire fighter (the victim) lost his life while directing traffic at an interstate highway incident. The victim’s department was dispatched to a motor vehicle collision (involving a minivan and a pickup truck) to check on a minor injury. The department’s ambulance responded with four personnel and was followed shortly by the victim who operated the department’s rescue truck. The ambulance slowed down on the interstate overpass and saw that the motor vehicle collision was on the interstate highway in the left eastbound travel lane, just east of the overpass and on-ramp. Law enforcement was not on scene at the time of the fire department’s arrival. After taking the onramp and negotiating traffic, the operator of the ambulance positioned the ambulance just off the shoulder in the median behind the minivan involved in the incident, which was resting in the interstate cut-through (see Photo 8 and Diagram). The truck, after it rear-ended the minivan, came to rest in the left eastbound travel lane (see Photo 8 and Diagram).

## **Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa**



**Photo 8. Aerial view of initial vehicle collision scene.**  
(Adapted from Google Earth® satellite image.)

**Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa**

**Diagram. Overhead view of incident scene when victim was struck.**



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## ***Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa***

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The emergency medical technician (EMT) and medic exited the rear of the ambulance to check on any potential injuries. The operator of the ambulance took command (IC) of the incident because the medic (the highest ranking officer on scene) had to attend to patient care needs. *Note: The IC did not advise the county dispatcher that he had taken command.* The rescue truck operated by the victim had just arrived on scene and was positioned in the left eastbound lane, behind the truck involved in the collision. The victim exited the rescue truck to speak with the IC and the fire fighter. They all noticed debris and the truck on the highway and decided to place the portable, collapsible emergency sign directly behind the rescue truck. Vehicular traffic in the eastbound lanes was heavy and fast; therefore, the IC thought that the truck and sign were too close to the collision scene, and he had the victim move the rescue truck back approximately 50 feet. Three cones were then placed on the passenger side of the truck involved with the collision to warn oncoming motorists to stay right of the center line.

The IC and fire fighter then worked on clearing debris from the roadway while the victim went to the rear of the rescue truck to direct traffic. The IC and fire fighter attempted to push the truck off the roadway but were unsuccessful. When the ISP officer arrived on scene, he positioned his patrol car between the rescue truck and truck involved in the collision. After exiting his patrol car, he had a conversation with the IC about the incident and moving the rescue truck and sign back even further (which was moved prior to the victim being struck).

The IC believed that, prior to the victim being struck, the rescue truck was positioned approximately 100 yards from the vehicle collision site with the sign placed 10 – 15 feet behind the rescue truck, and no additional cones were placed prior to the sign (see Diagram). The IC and fire fighter continued to remove debris, but the IC was concerned that approaching motorists were not slowing down. The IC then walked to where the victim was directing traffic to have a conversation with him about the traffic (between the median and rumble strip). As the IC was walking back to check on the medic and EMT taking care of the motorists from the initial collision, he heard a loud “thud” and turned around to see a car coming toward him in the median. He yelled ahead to the responders that were on scene (ambulance crew and law enforcement) to warn them of the oncoming vehicle. *Note: Both the medic and EMT were in the back of the ambulance getting patient refusals when the victim was struck.* After the vehicle came to a stop, the motorist exited the vehicle hysterically. The IC looked back toward where he had last talked to the victim and he was not there. The IC visually scanned the median and observed what appeared to be the victim lying on the left-hand shoulder of the westbound lanes. The IC walked over to the victim and observed fatal injuries with no signs of life. The victim was pronounced dead on scene. The IC advised the county dispatcher of the fire fighter down, and additional resources for traffic control were requested.

### **Additional Information from Motorists**

Motorists approaching the incident from the west (traveling in the eastbound lanes) recall seeing the victim standing in the left eastbound travel lane, well ahead (west) of where the emergency sign had been placed by the fire department (i.e., outside the TIMA). Lights from emergency vehicles on scene could be seen as well. It appeared to the approaching motorists that the victim was directing them to move over to the right eastbound travel lane. A motorist traveling in the right eastbound travel lane

## ***Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa***

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came upon a motorist that had slowed down (due to traffic from the initial motor vehicle collision) just before reaching the TIMA. It appeared that this motorist came upon the slowed vehicle and incident scene too quickly and had to choose between rear-ending the slowed vehicle in front of him or maneuvering the vehicle into the left lane and median. The motorist chose to swerve left to miss the slowed vehicle and unknowingly struck the victim standing in the left eastbound travel lane. According to ISP, the motorist who struck the victim was not under the influence of any substances.

### **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 led to the fatality:

- Insufficient training, staffing, equipment, and standard operating procedures to adequately establish a traffic incident management area to protect emergency responders and provide advanced warning to approaching motorists
- Victim working in a travel lane outside the established traffic incident management area
- Lack of established pre-incident plans and agreements regarding traffic control incident management at roadway incidents with agencies responsible for responding to roadway incidents
- Inattentive motorist.

### **Cause of Death**

According to the death certificate, the medical examiner listed the victim's cause of death as due to multiple blunt forces injuries.

### **Recommendations**

***Recommendation #1: Fire departments should ensure that emergency responders receive proper training, and have adequate staffing, sufficient equipment, and appropriate procedures in place for responding to and operating at a roadway emergency incident.***

Discussion: All responders that have the potential of being assigned to traffic control duties should be trained in the use of advanced warning devices, safe-positioning of an apparatus, donning high-visibility personal protective equipment (PPE) at all roadway incidents (noting limitations during fire suppression and hazardous material type incidents), available/necessary resources (e.g., personnel, vehicles, equipment), general safety practices, and establishment of the traffic incident management area (TIMA). Training should be provided to all emergency responders before responding to a roadway incident.

The *Manual on Uniform Traffic Control Devices (MUTCD)* is a resource for establishing temporary traffic control. *MUTCD* Chapter 6I, “– Control of Traffic Through Incident Management Areas,”

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## ***Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa***

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defines a traffic incident management area as “an area of highway where temporary traffic controls are installed, as authorized by a public authority or the official having jurisdiction of the roadway, in response to a road user incident, natural disaster, hazardous material spill, or other unplanned incident.”<sup>4</sup> It is a type of temporary traffic control (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.”<sup>4</sup> Also, according to the MUTCD, traffic incidents can be divided into three general classes of duration, each of which has unique traffic control characteristics and needs. These classes are listed below:

- A. Major—expected duration of more than 2 hours
- B. Intermediate—expected duration of 30 minutes to 2 hours
- C. Minor—expected duration under 30 minutes

Due to the duration of this incident it would have been classified as an intermediate traffic incident. These types of incidents require traffic control on scene to divert traffic past the incident and may also require full roadway closures for short periods to allow emergency responders time to accomplish their tasks. MUTCD guidance for intermediate traffic incidents states that all TTC devices needed to set up the area should be available so that they can be readily deployed. The TIMA should include the proper traffic diversions, tapered lane closures, and upstream warning devices to alert traffic approaching the queue and to encourage early diversion to an appropriate alternative route. Attention should be paid to the upstream end of the traffic queue such that warning is given to road users approaching the back of the queue. If manual traffic control is needed, it should be provided by qualified flaggers or uniformed law enforcement officers.<sup>4</sup>

Warning devices and transition areas are a means by which emergency personnel can convey information to motorists approaching an incident scene, referred to as the “advance warning area.” Warning devices in the advance warning area may vary from a single sign or high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle to a series of signs in advance of the incident scene. NFPA 1500 *Standard on Fire Department Occupational Safety and Health Programs* section 8.7.5 states that one or more of the following warning devices be used to warn oncoming traffic of the emergency operations and the hazards to members operating at the incident: (1) fluorescent and retro-reflective warning devices such as traffic cones, (2) Federal Highway Administration approved 48-inch by 48-inch retro-reflective signs stating “Emergency Scene Ahead” (with directional arrow overlay), (3) illuminated warning devices such as highway flares, and (4) other devices appropriate to warn oncoming traffic of the emergency operations.<sup>5</sup> Additionally, cones should be predominantly orange and should be made of a material that can be struck without causing damage to the impacting vehicle. For day time and low-speed roadways, cones should be not less than 18 inches in height. When cones are used on freeways and other high-speed highways or at night on all highways, or when more conspicuous guidance is needed, cones shall be a minimum of 28 inches in height with retro-reflective markings.<sup>5</sup> NFPA 1500 section 8.7.6 states that warning devices should be placed and used with proper considerations given to visual obstruction, such as hills, curves, or blind spots, or unusual localized weather conditions, such as fog or rain.<sup>5</sup> Weather conditions, curves, and hills that limit visibility of the incident scene require that the advance warning devices be placed at an even greater distance. In this



## ***Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa***

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incident, limited visibility should have been considered, because the eastbound lanes crested slightly at the overpass just before the established TIMA.

Portable signs or portable changeable message signs can be transported by an emergency vehicle to the incident scene where they can be placed in a location that allows maximum visibility to oncoming traffic. The *MUTCD* states “where special emphasis is needed, signs may be placed on both the left and right sides of the roadway. Signs mounted on portable supports may be placed within the roadway itself. Signs may also be mounted on or above barricades.”<sup>4</sup> The primary purpose of portable changeable message signs is to advise the road user of unexpected situations such as changes in speed, visibility, or traffic pattern.

The roadway on which the incident occurred had a 70-mph posted speed limit. The fire department had placed three 18-inch orange traffic cones around the damaged truck and a portable sign upstream and within the eastbound left travel lane. No additional TTC devices were available to establish the TIMA and warn approaching motorists. At the time of the incident, the rescue truck did not have chevrons on the back. The victim placed himself within the roadway to direct approaching motorists to slow down, and move over. NFPA 1500 states that each department shall establish, implement, and enforce SOPs regarding emergency operations for traffic incidents.<sup>5</sup> A model SOP for establishing advance warning and transition areas at roadway-related incidents can be found at [[http://www.respondersafety.com/Articles/Model\\_SOG\\_Available\\_for\\_Download\\_on\\_Deploying\\_Cones\\_and\\_flares\\_at\\_Roadway\\_Incidents.aspx](http://www.respondersafety.com/Articles/Model_SOG_Available_for_Download_on_Deploying_Cones_and_flares_at_Roadway_Incidents.aspx)].<sup>6</sup>

The National Fire Protection Association (NFPA) is currently drafting a standard titled, *NFPA 1091 Standard on Professional Qualifications for Traffic Control Incident Management*. This document will provide emergency responders with information related to safe operations at a roadway incident. A draft copy of NFPA 1091 can be found at <http://www.nfpa.org/AboutTheCodes/AboutTheCodes.asp?docnum=1091&tab=nextedition>. Fire departments need to remember that personnel used for traffic control purposes shall receive training that is commensurate with their duties and in accordance with any applicable state and local laws and regulations.<sup>5</sup> *Note: For more information related to training, PPE, and policies/procedures, see the “Additional Information” section at the end of this report.*

***Recommendation #2: Fire departments should ensure that standard operating guidelines include guidance on identifying and maintaining a safe location while working in or near moving traffic.***

Discussion: Emergency responders should operate defensively with an awareness of the high risk associated with working in or near moving traffic, because responders cannot rely on approaching motorists to see them, slow down, and/or move over. Motorists may ignore traffic signs and regulations for various reasons, including poor visibility, distraction, being under the influence of alcohol or drugs, and/or because of a medical condition that affects their judgment or abilities. This line-of-duty death provides a reminder that emergency responders can never depend solely on lights, signs, flares, or cones to protect them when they are working near moving traffic. Fire departments need to ensure that multiple prevention strategies are in place and emergency responders must maintain

## ***Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa***

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an awareness to what is going on around them at all times. NFPA 1500 states fire departments should make every effort to protect members from conflict with motor vehicle traffic.<sup>5</sup> Fire departments should train members on how to identify hazardous situations and preplan an escape strategy should they encounter a dangerous traffic situation, such as a vehicle entering the temporary traffic control zone.<sup>7</sup> The placing of advanced warning devices to aid oncoming traffic in recognition of a TIMA may not provide emergency service personnel with complete protection from traffic hazards. Personnel should remain in an area of safety created by the proper positioning of apparatus and warning devices. A vehicle with emergency lights flashing provides additional warning and additional protection to the incident scene.

During this incident, the victim was struck while standing in the left lane as he was directing traffic to move over to the right lane. He was standing outside the TIMA and unprotected from approaching vehicles.

***Recommendation #3: Fire departments should establish pre-incident plans and agreements regarding traffic control incident management at roadway incidents with other public safety agencies (e.g., fire departments, EMS, and law enforcement), local/state departments of highways, and private sector responders.***

Discussion: Pre-incident planning is fundamental to effective traffic control incident management. The white paper *Protecting Emergency Responders on the Highways*<sup>8</sup> states that 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. All agencies that may respond to motor vehicle incidents should be fully involved in the process, formatting, and developing of pre-incident plans, and ensure that the final plan is easily understood and implemented within their agency.<sup>9</sup>

According to the U.S. Fire Administration document, *Traffic Incident Management Systems*,<sup>10</sup> specific concepts that should be addressed in pre-incident planning for roadway incident operations include the following:

- All agencies that may respond to roadway incidents should be fully involved in the development of the plan and ensure that the final plan is easily understood and implemented within their agency.
- Each agency involved must provide initial and refresher training and ensure that individual and organizational roles are understood.
- Each agency should make sure that personnel are at least minimally briefed on the roles and procedures of other plan participants to avoid on-scene confusion and conflict.

Local authorities, including law enforcement, departments of transportation, fire departments, municipal leadership, businesses, and other interested parties, should work together to develop local traffic control incident management plans that address the needs of the local community in the event of

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## **Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa**

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traffic disruptions. These traffic control incident management plans should address a wide range of events that could affect normal roadway traffic, such as traffic incidents, hazardous material spills, fires, natural disasters, inclement weather, parades, and other events. States and municipalities, including the transportation department, in conjunction with fire departments, emergency medical responders, law enforcement, and private sector responders (e.g., tow truck operators), should develop these plans to include automatic response protocols detailing responsibilities of each at roadway incidents. Governing entities should ensure that adequate funding is available to staff and equip emergency response protocols once jointly established and agreed upon by all parties involved. Preplanning such incidents allows fire departments and other interested parties to identify needs, locate sources of necessary resources and materials, and develop mutual-aid-response agreements.

Prior to this incident, no agreements had been established.

***Recommendation #4: Fire departments should ensure that high-visibility chevrons and reflective markings are applied to all apparatus to enhance conspicuity while parked at emergency scenes and during emergency response.***

Discussion: Highway incident scene safety has been at the forefront of efforts to reduce fire fighter death and injury. Several initiatives to increase conspicuity of emergency apparatus have been finalized and guidance has been provided to assist fire departments in implementing these procedures.<sup>11</sup> NFPA 1901 *Standard for Automotive Fire Apparatus* was revised and became effective in January 2009. Its purpose is to enhance visibility of emergency vehicles that are parked along roadways during emergency incidents. Chapter 1.3.1 states, “This standard shall apply to new fire apparatus that meet the following criteria: (1) that have 10,000 lb (4500 kg) or greater gross vehicle weight rating (GVWR) or are trailers intended to be towed by fire apparatus under emergency response conditions, (2) that are designed for use under emergency conditions to transport personnel and equipment and to support the suppression of fires and mitigation of other hazardous situations, or (3) that are contracted for on or after January 1, 2009.”<sup>12</sup> The specific marking requirements are outlined in NFPA 1901 Chapters 15.9.3.1 and 15.9.3.2 states “A retro-reflective stripe(s) shall be affixed to at least 50 percent of the cab and body length on each side, excluding the pump panel areas, and at least 25 percent of the width of the front of the apparatus. The stripe or combination of stripes shall be a minimum of 4 inches (100 mm) in total width. At least 50 percent of the rear-facing vertical surfaces, visible from the rear of the apparatus, excluding any pump panel areas not covered by a door, shall be equipped with retro-reflective striping in a chevron pattern sloping downward and away from the centerline of the apparatus at an angle of 45 degrees.”<sup>12</sup> *Note: Additional information and requirements related to vehicle markings, required protective ensembles, and traffic control devices can be found within NFPA 1901.*

NFPA 1901 applies to newly manufactured apparatus and is not retroactive. However, in many cases it can be cost effective and easy to retrofit existing apparatus to improve fire fighter emergency work zone safety. Fire departments should consider putting reflective tape on apparatus doors, on fixed sections that are not blocked by doors or ladder racks, and around the bottom of the apparatus. A video detailing guidance for retrofitting apparatus with the newly recommended safety lighting and



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## **Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa**

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markings can be found on the Emergency Responder Safety Institute website, <http://www.respondersafety.com/MarkedAndSeen.aspx>.<sup>13</sup> Roadway incident response safety procedures call for fire apparatus to park on an angle at roadway incident scenes to create a work area that is protected from passing traffic. Often apparatus emergency lighting is not as effective when parked at an angle. A more effective design calls for emergency lights to be mounted up high on the back of the apparatus to provide 360° visibility. Amber lighting on the rear of apparatus can be very effective at warning motorists of an active emergency work zone. Amber lights convey a message of caution and motorists are accustomed to slowing down for amber warning lights in highway construction work zones.<sup>13</sup> During this incident, the fire department vehicles responding to this incident were manufactured prior to 2009 when NFPA 1901 *Standard for Automotive Fire Apparatus* was revised to include the use of chevrons and additional requirements for reflective markings on apparatus.

***Recommendation #5: Motorists should be attentive at all times while operating a motor vehicle, especially when approaching and driving through a traffic incident management area, so that they avoid striking emergency responders, other vehicles, and/or traffic control devices.***

Discussion: Motorists need to maintain a constant awareness of their surroundings while operating a motor vehicle. They need to pay attention to such things as signs, emergency scenes, traffic patterns, work zones, and various roadway hazards (e.g., slowed/stopped vehicles, weather, and animals). Motorists could benefit from additional incident related information disseminated by other sources. Various means of disseminating incident related information to affected motorists are listed below:

- Commercial radio broadcasts
- Highway advisory radio
- Variable message signs
- In-vehicle or personal data assistant information or route guidance systems
- Commercial and public television traffic reports
- Changeable message boards

Traffic reports on radio and television stations have been a traditional means by which motorists receive traffic information, including incident-related warnings. Radio and television stations receive the traffic information they use in their reports from a variety of sources, which may include public transportation agencies, or by monitoring emergency (police and fire) radio frequencies. Public agencies, radio, and television stations can communicate important incident-related information to motorists. This information may help motorists be more prepared for what's ahead and perhaps avoid the incident scene. Motorist information should be disseminated as soon as possible and should continue beyond the time it takes to clear an incident. Motorist information should be disseminated until traffic flow is returned to normal conditions. This may take hours if an incident occurs during a peak traffic period or, has regional impacts.<sup>14</sup>

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## ***Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa***

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## **Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa**

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### **Investigator Information**

This incident was investigated by Stacy C. Wertman, Safety and Occupational Health Specialist with the Fire Fighter Fatality Investigation and Prevention Program, Surveillance and Field Investigations Branch, Division of Safety Research, NIOSH located in Morgantown, WV. An expert technical review was provided by Steve Austin from the Cumberland Valley Volunteer Firemen's Association and Emergency Responder Safety Institute. A technical review was also provided by the National Fire Protection Association, Public Fire Protection Division. NIOSH would like to thank the Iowa Department of Public Health for their assistance during the investigation.

### **Additional Information**

Emergency Responder Safety Institute <http://www.respondersafety.com/>

Manual on Uniform Traffic Control Devices <http://mutcd.fhwa.dot.gov/>

National Traffic Incident Management Coalition  
<http://www.transportation.org/Default.aspx?SiteID=41>

Iowa State Patrol, Department of Public Safety Crash Information Report  
[http://accidentreports.iowa.gov/index.php?pgname=IDOT\\_IOR\\_MV\\_Accident\\_details&id=56953](http://accidentreports.iowa.gov/index.php?pgname=IDOT_IOR_MV_Accident_details&id=56953)

U.S. Department of Transportation, Federal Highway Administration  
[http://ops.fhwa.dot.gov/eto\\_tim\\_pse/about/tim.htm](http://ops.fhwa.dot.gov/eto_tim_pse/about/tim.htm)

International Association of Fire Fighters *Best Practices for Emergency Vehicle and Roadway Operations Safety in the Emergency Services* <http://www.iaff.org/hs/EVSP/guides.html>

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***Volunteer Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident – Iowa***

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