

Death in the line of duty...



A summary of a NIOSH fire fighter fatality investigation

February 12, 2013

Career fire captain killed, fire fighter and police officer injured at the scene of a motor vehicle crash - Arkansas

Executive Summary

On March 19, 2012, a 56-year-old fire officer was struck and killed at a motor vehicle crash scene. The captain and engineer (driver/operator) of Engine 4 responded initially to a report of a single vehicle crash on a state highway. The vehicle had struck and damaged a natural gas meter which was sheared off below grade causing a natural gas leak. While Engine 4 was responding, the captain requested the response of the gas company. The civilian driver was not injured in the crash. Also, a city police officer responded to investigate the vehicle crash. The captain and engineer initially attempted to control the gas leak, but were unable to do so. The captain contacted the Dispatch Center and requested the response of the gas company be expedited due to the severity of the leak. The captain, engineer, and the police officer were standing on the shoulder of the southbound lane of traffic when a van struck the two fire fighters and the police officer. The captain was killed upon impact. The police officer and engineer were seriously injured and were transported to metropolitan trauma center for treatment.



A photograph of the incident scene looking northbound from the roadway. The white SUV near the power pole in front of the residence was involved in the initial accident. The vehicle (van) which struck the fire fighters and police officer is in the ditch in the foreground. The fire fighters and police officer were standing on the shoulder on the north side of the driveway near the SUV.

(Photo courtesy of the police department)

Contributing Factors

- Actions of the van driver
- Initial single vehicle crash involving damaged/leaking natural gas meter
- Inadequate protection of the highway/roadway work area
- *Fire fighters and police officer standing in close proximity to moving traffic*
- Inadequate traffic management
- *Lack of procedures for controlling a damaged/leaking natural gas meter.*

Key Recommendations

- Develop pre-incident plans regarding deployment to traffic incidents, scene safety, situational awareness, and traffic control for highway/roadway emergency work zones
- Develop and implement standard operating procedures (SOPs) for highway/roadway incidents including deployment protocols within the department's jurisdiction
- Ensure that all members receive training for conducting emergency operations at highway/roadway incidents.
- Develop and implement standard operating procedures for response to incidents involving natural gas leaks
- Utilize the principles of the incident management system for effective command and control of highway/roadway incidents.

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 or call toll free 1-800-CDC-INFO (1-800-232-4636).



Death in the line of duty...



A summary of a NIOSH fire fighter fatality investigation

February 12, 2013

Career fire captain killed, fire fighter and police officer injured at the scene of a motor vehicle crash - Arkansas

Introduction

On March 19, 2012, a 56-year-old fire officer was struck and killed at the scene of a motor vehicle crash. On March 20, 2012, the United States Fire Administration (USFA) notified the National Institute for Occupational Safety and Health (NIOSH) of this incident. On April 2-6, 2012, an investigator and safety engineer from the NIOSH Fire Fighter Fatality Investigation and Prevention Program traveled to Arkansas to investigate this incident. The NIOSH investigators met with representatives of the victim's fire department, members of the local IAFF union, and local law enforcement involved with this incident. During the investigation, witness statements were reviewed and interviews were conducted with the fire fighters, fire officers, and law enforcement personnel who responded to this incident. NIOSH investigators also reviewed the fire department's standard operating procedures (SOPs), department and state training requirements, and the training records of the victim, injured fire fighter (engineer), and the Incident Commander (IC). The victim's turnout gear was inspected and photographed; the incident scene was visited and photographed; and investigators reviewed incident scene photographs, videos, fire ground dispatch tapes, and area maps. NIOSH investigators met numerous times with city police department officers investigating both crashes and the actions of the driver of the van. NIOSH investigators traveled to the Arkansas State Fire Academy in Camden to discuss the state training requirements and traveled to meet with the State Fire Marshal in Little Rock regarding the investigation of this incident.

Fire Department

This career department consists of 64 uniformed members and one administrative assistant. The department operates four fire stations staffing 1 battalion, 4 engine companies, 1 truck company, 1 medium rescue (cross-staffed by fire fighters from the truck company), and 3 Advanced Life Support (ALS) medic units. Each riding position is equipped with a portable radio.

The administrative staff consists of the fire chief and 3 battalion chiefs (one battalion chief assigned to each shift: Red – Battalion 1; Green – Battalion 2; and Black – Battalion 3). All members assigned to the Operations Division work a 24 hour duty shift with 48 hours off (56-hour work week). Each shift is assigned 20 personnel with a minimum staffing of 17 on-duty personnel per shift. The rank structure is fire chief, battalion chief, captain, engineer, and fire fighter. There are 11 captains, 14 engineers, and 33 fire fighters assigned to the Operations Division. Twenty-four members are certified as paramedics. The Services Division consists of the Fire Marshal (Captain) and the Training Officer/Safety Officer/Public Information Officer (Captain).

The department protects an area of 28.2 square miles with a population of 28,300. The daytime population increases to approximately 50,000 due to an air force base within the city limits. In 2011, the department responded to 3,911 alarms, of which 3,070 were EMS incidents. In 2010, the fire department responded to 3,772 alarms, of which 2,527 were EMS incidents. In 2009, the department

responded to 3,838 incidents, of which 2,769 were EMS incidents. The department averages 46 "working" structure fires annually.

Emergency medical services response and transport is provided by the fire department. The minimum level of emergency medical care is emergency medical technician/basic (EMT/B). In addition to fire-fighting operations, the department provides vehicle extrication and hazardous materials mitigation. Response for a hazardous materials incident requiring technician level entry would be provided by a mutual aid fire department located in the county seat and the air force base fire department.

The fire department and the air force base fire department have an automatic aid agreement for response to structure fires. The fire department has mutual aid agreements for response to a structure fire with two neighboring fire departments.

The department's deployment for structure fires is as follows: *Residential Structure Fire*: 3 Engines, 1 Truck, 2 Medic Units, and 1 Battalion Chief; *Commercial Structure Fire* is: 4 Engines, 1 Truck, 2 Medic Units, and 1 Battalion Chief.

The fire department provides a medical examination based upon the following criteria:

- Ages 20 29: Every 3 years
- Ages 30 39: Every 2 years
- Ages 40 & older: Annually

The medical examination meets the requirements of NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments*.

Training and Experience

The State of Arkansas requires an individual who has successfully completed the entrance requirements for employment with a career fire department to attend and successfully complete an eight-week course at the State Fire Academy located in Camden.

For an individual applying for the position of fire fighter, the fire department requires the individual must pass the following:

- written Civil Service Commission examination;
- background investigation;
- oral interview with fire department staff;
- the Candidate Physical Ability Test (CPAT)
- medical examination per the requirements of NFPA 1582, *Standard on Comprehensive* Occupational Medical Program for Fire Departments

Once an individual is hired by the city, the individual becomes a recruit fire fighter. Prior to attending the State Fire Academy, the recruit fire fighter is assigned to day work for two weeks. During this time, the recruit fire fighter attends a city and fire department orientation. Also, all personal protective equipment is procured during this time.

Upon completion of recruit school (eight weeks) at the State Fire Academy, the recruit fire fighter becomes a probationary fire fighter and is certified as follows:

- NFPA 1001, Standard for Fire Fighter Professional Qualifications; Fire Fighter I and Fire Fighter II (IFSAC Certification);
- Wildland Fire Fighter (state Department of Forestry);
- Hazardous Materials Awareness and Hazardous Materials Operations (IFSAC Certification);
- National Incident Management System (NIMS): ICS 100, *Introduction to ICS*; ICS 200, *Basic ICS*; IS-700, *National Incident Management System*, and IS-800B, *National Response Framework*;
- Chemical, Biological, Radiological, Nuclear, and Explosive (CBRNE) Awareness;
- US Department of Transportation First Responder: National Standard Curriculum (40 hours);

The State Fire Academy will provide, for an additional fee, *Emergency Medical Technician/Basic* (EMT/B) certification (5 weeks) and NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*, Driver/Operator: Pumper (IFSAC Certification) (2 weeks).

After completion of recruit school at the State Fire Academy, the probationary fire fighter is given an assignment in the Operations Division. At the end of the probationary period (12 months), the probationary fire fighter is certified by the city's Civil Service Commission as a fire fighter.

The department requires 20 hours of training per month. The training reports are submitted to the Training Officer, who maintains the department's training records.

As described earlier, the rank structure in the fire department is as follows: fire chief, battalion chief, captain, engineer, and fire fighter. In order to test for the promotional process, an individual must have 2¹/₂ years in grade. The testing process is governed by state civil service requirements and the testing is conducted by the city's Civil Service Commission.

The victim had 32 years of experience with the fire department serving as a captain for 22 years. He had obtained the following certifications: NFPA 1001, *Standard for Fire Fighter Professional Qualifications; Fire Fighter I* and *Fire Fighter II*; *Hazardous Materials Awareness and Hazardous Materials Operations*; Wildland Fire-Fighting Operations; ICS 100, *Introduction to ICS*; IS-700, *National Incident Management System*; Arkansas Department of Health *Emergency Medical Technician Basic*; and NFPA 1021, *Standard for Fire Officer Professional Qualifications*, Fire Officer I. Additionally, the victim had taken courses on emergency vehicle driving and operations, vehicle extrication, pump operations: Preparation, *Tactics, and Decision Making*; *Fire and Arson Detection*; *Emergency Response to Terrorism*; Clandestine Drug Labs; LP Gas Emergencies; and National Fire Incident Reporting System (NFIRS).

The injured fire fighter had 14 years of experience with the fire department and had been an engineer for 6 years. He had obtained the following certifications: NFPA 1001, *Standard for Fire Fighter Professional Qualifications*; *Fire Fighter I* and *Fire Fighter II* (IFSAC Certification); Hazardous Materials Awareness and Hazardous Materials Operations; NFPA 1002, *Standard for Fire Apparatus*

Driver/Operator Professional Qualifications, Driver/Operator: Pumper (IFSAC Certification) Arkansas Department of Health Emergency Medical Technician Basic; Wildland Fire-Fighting Operations; ICS 100, Introduction to ICS; ICS 200, Basic ICS; and IS-700, National Incident Management System. Additionally, the injured fire fighter had taken courses on: Introduction to Fire Protection, emergency vehicle driving and operations, vehicle extrication, pump operations, supervisory principles and practices; Fire and Arson Detection; Emergency Response to Terrorism; Clandestine Drug Labs; LP Gas Emergencies; and National Fire Incident Reporting System (NFIRS).

Equipment and Personnel

The following units responded to the incident on the initial alarm or were special called.

Resource Designation	Staffing	Time Dispatched	Time On-Scene
Engine 4	Captain (Victim) Engineer (Injured)	2230	2235
Medic 2	Paramedic/FF Paramedic/FF	2248	2252
Engine 1	Captain Engineer Fire Fighter	2250	2256
Medic 1	Paramedic/FF EMT/FF	2250	2256
Battalion 2	Battalion Chief	2250	2256
Medic 3	Paramedic/FF EMT/FF	2255	2257
Police Unit 361	Police Officer (Injured)	2230	2234
Police Unit 301	Lieutenant (Shift Commander)	2247	2254
Police Unit 381	Police Officer	2247	2252
Police Unit 341	Police Officer	2247	2307
Police Unit 331	Police Officer	2247	2251



Timeline

This timeline is provided to set out, to the extent possible, the sequence of events according to recorded 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 radio transmissions. This timeline is not intended, nor should it be used, as a formal record of events.

Incident Conditions	Time	Response & Incident Operations
March 19, 2012		
"911" call reporting a two-vehicle crash with one vehicle striking a gas meter along the highway; Reported with no injures;	2228 Hours	
Fire Department dispatched; Tac Channel - FD Channel 2;	2230 Hours	Engine 4 only for an investigation;
	2232 Hours	Engine 4 marks responding to the incident; Requests that the gas company be notified;
	2235 Hours	Engine 4 on scene; establishes "Command";
	2241 Hours	"Command" advises the dispatcher to expedite the gas company; that the meter is sheared off about $8" - 10"$ below ground level with an active leak;
Citizen's vehicle strikes two fire fighters and police officer;	2246 Hours	
	2246 Hours	Injured police officer advises police dispatcher that he has been struck by a vehicle;
Medic 2 dispatched for police officer struck by a vehicle;	2246 Hours	
	2247 Hours	Medic 2 responding;

Incident Conditions	Time	Response & Incident Operations
	2248 Hours	Medic 2 requests "Med Flight" be placed on standby;
	2248 Hours	Injured police officer advises dispatcher that "everyone is down"; one possible Code Blue and two serious;
Dispatcher advises that fire fighters have been struck as well; dispatching additional medic unit;	2249 Hours	Medic 2 requests an engine company be dispatched;
	2249 Hours	Battalion 2, Engine 1, and Medic 1 responding;
Dispatcher advises on FD Radio "Code Blue" at the incident;	2250 Hours	
	2250 Hours	Medic 1 requests the status of "Med Flight"; Medic 1 also requests that Medic 3 respond;
	2251 Hours	Police Units 331 and 381 arrive on scene;
	2252 Hours	Medic 2 on scene;
Battalion 2 provides scene size-up;	2254 Hours	3 patients: 1 black tagged (deceased); 1 red tagged (immediate medical care); 1 yellow tagged (stable, but needs medical care); launch "Med Flight"; requests Medic 3:
	2254 Hours	Medic 3 responding;
"Med Flight" launched;	2255 Hours	Medic 1 on scene;
	2256 Hours	Battalion 2 on scene; Establishing "Command"; Engine 1 and Medic 1 on scene;
	2257 Hours	Medic 3 on scene;
	2259 Hours	"Command" requests the status of the 2^{nd} medvac helicopter; Advises dispatcher of the landing zone;

Incident Conditions	Time	Response & Incident Operations
Dispatcher advises "Command" to switch to Public Safety radio channel to contact "Med Flight";	2307 Hours	"Command" requests status on both helicopters;
	2310 Hours	Medic 2 on-scene at landing zone with injured fire fighter; fire fighter transferred to "Med Flight";
	2315 Hours	Gas company on scene;
	2318 Hours	Medic 1 transporting police officer to trauma center;
	2332 Hours	Medic 1 arrives at trauma center;
	2340 Hours	Engine 1 asks for the status of Medic 1: Medic 1 had arrived at trauma center;
	2355 Hours	Medic 2 available;
March 20, 2012		
	0003 Hours	Medic 2 in quarters;
	0017 Hours	Medic 1 enroute back to the city;
	0054 Hours	Medic 3 available and enroute to Fire Station 2;
	0059 Hours	Medic 1 in quarters at Central Fire Station; in-service;
Fire Department "Command" is terminated at the incident scene;	0130 Hours	All fire department units have cleared the scene;

Personal Protective Equipment

At the time of the incident, the victim and the injured fire fighter were wearing their station work uniforms and a department issued high-visibility traffic vest. Though neither fire fighter was wearing turnout gear, NIOSH investigators did examine the turnout gear. Both sets of turnout gear were photographed and were compliant with NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*.

Weather and Road Conditions

At approximately 2230 hours, the weather in the immediate area was reported to be 71 degrees Fahrenheit, a dew point of 60 degrees F., and the relative humidity was 68%. Wind conditions were up to 8 miles an hour from the south southeast with no wind gusts. The sky was clear and there had been no precipitation in the past 5 hours. $\frac{1}{2}$

Investigation

On March 19, 2012 at 2230 hours, Engine 4 (staffed with a captain (victim) and an engineer) were dispatched to a report of a single-vehicle crash on a two-lane state highway. The Dispatch Center also assigned one police officer to respond as well. While enroute to the incident, the fire dispatcher advised Engine 4 that the vehicle involved in the crash had struck a natural gas meter. The captain asked the fire dispatcher to contact the gas company to respond as well.

At 2234 hours, Police Unit 361 arrived on scene and parked in the southbound lane of the roadway. Approximately one minute later, Engine 4 (E4) arrived on scene and parked on the shoulder of the roadway behind the police vehicle. Both the police vehicle and the pumper had emergency warning lights activated. The captain and engineer exited the apparatus, donned a high visibility traffic vest over their station work uniforms, and went to check on the occupants of the vehicle involved in the The vehicle involved in the crash was a white sport utility vehicle (SUV) driven by a female, crash. who was the sole occupant. The occupant was out of the vehicle and standing away from the vehicle. She stated that she was uninjured and did not need any medical attention. She later told the police officers investigating this crash that she was northbound and came upon a vehicle stopped partially in the roadway. She swerved to avoid hitting the stopped vehicle. She applied her brakes, skidded off the roadway, and went into a ditch striking the gas meter on the southbound side of the roadway (See **Photo 1**). Note: This incident started when the driver of a late model vehicle stopped on the shoulder of the northbound lane for unknown reasons. According to a witness, the driver was in the vehicle when the SUV swerved and went off the roadway in an attempt to miss the stopped vehicle. The driver of the stopped vehicle fled on foot once law enforcement personnel were dispatched. The fire fighters moved the driver away from the vehicle and leaking gas meter. She eventually went across the street with a witness who had stopped to assist.



Photo 1. The incident scene showing the location of the residential gas meter in proximity to the telephone pole and the residential structure.

(Adapted from Google Earth® satellite image.)

The captain and the engineer then moved towards the leaking gas meter and tried to determine if they could stop the leak. After attempting to secure the leaking gas meter by shutting off the meter with a wrench, the captain determined they could not secure the leak. The meter had been knocked completely away from the piping. Also, the piping for the meter had been broken off 8" - 10" below ground level. At approximately 2241 hours, the captain of E4 put in another request for the gas company to expedite their response.

The captain and engineer along with the police officer had moved to the shoulder of the roadway upwind of the damaged gas meter to wait for the gas company to arrive (**See Diagram 1**). At approximately 2245 hours, a van heading southbound passed both Engine 4 and the police vehicle, accelerated, and then drove onto the shoulder of the roadway where the captain, engineer, and the

police officer were standing. All three individuals were struck by the van which continued down the ditch line across the driveway, finally coming to a stop in the ditch on the other side of the driveway (**See Diagram 2 and Photo 2**). *Note: The driver of the van was the son of the female driver of the SUV. She had called her son advising her that she had been involved in a crash.*

The captain of Engine 4 was killed instantly. He was thrown by the impact and landed in the driveway of the single family dwelling. The engineer was thrown approximately 130 feet by the impact, and was found in the yard of the single family dwelling on the other side of the driveway, severely injured. The police officer was thrown by impact into the southbound lane of the roadway. *Note: The entire incident was captured by the "dash cam" (dash mounted camera) in Police Unit 361 which included audio from a microphone the injured police officer had been wearing.*

At 2246 hours, the injured police officer radioed the police dispatcher that he had been struck by a vehicle at the incident scene and requested assistance. At 2246 hours, Medic 2 (fire fighter/EMT and fire fighter/paramedic) were dispatched to the incident scene. At 2247 hours, Medic 2 was enroute. While enroute, Medic 2 requested the "Med Flight" air ambulance be placed on standby. At 2248 hours, the injured police officer provided a very calm and thorough description of what had just occurred. The injured police officer advised that one patient may be "Code Blue" (deceased) and the other two patients are 'serious". With the additional information, the fire dispatcher sent an additional medic unit (Medic 1). Also, Medic 2 requested an engine company respond.

At 2249 hours, Battalion 2, Engine 1, and Medic 1 responded to the incident based upon their monitoring the fire "tac" channel and the police channel. While enroute, Medic 1 asked about the status of "Med Flight" and also requested that Medic 3 respond. At 2251 hours, police department Unit 331 arrived on scene. Unit 331 parked and blocked the northbound lane of the roadway. He then checked on the police officer and then went to check the condition of both fire fighters. Unit 331 realized that the captain of E4 was deceased. He then went to the engineer of E4 and stayed with him and assisted the crew from Medic 2 with patient care. Unit 381 arrived at the same time Medic 2 arrived and stayed with the injured police officer and assisted Medic 1 with patient care.



Diagram 1. The incident scene after the SUV struck the gas meter. The driver of the SUV was trying to avoid hitting the disabled vehicle. Engine 4 and Police Unit 361 are on scene.







Photo 2. A photograph of the crash scene looking southbound after the second motor vehicle incident. The white SUV near the power pole in front of the single family dwelling was involved in the initial accident. The vehicle (van) which struck the fire fighters and police officer is in the ditch on the other side of the driveway. The fire fighters and police officer were standing on the shoulder on the north side of the driveway. The vehicle that was stopped or disabled is on the shoulder of the northbound lane in the foreground. Also, at this time, Engine 4 and the police vehicle have been moved from the incident scene.

(Photo courtesy of the police department)

At 2252 hours, Medic 2 arrived on scene. One fire fighter/paramedic from Medic 2 conducted a rapid patient assessment of the fire fighters and police officer. At 2254 hours, the other fire fighter/paramedic from Medic 2 radioed to Battalion 2 the size-up of the incident scene. He advised that there were a total of three (3) patients. The assessment indicated that one patient was black tagged (Captain of E4); one patient was red tagged (Engineer of E4); and one patient was yellow tagged (police officer). The fire fighter/paramedic asked that "Med Flight" be launched and if Medic 3 was responding. Both paramedics began treatment on the engineer from E4. The injured fire fighter

was stabilized and moved to Medic 2 for further patient care. After further advanced life support, the fire fighter was stabilized enough to be moved to the landing zone which had been established by police department Unit 371 which consisted of two police officers. The landing zone was a church parking lot which was located about one mile south of the incident scene. At 2310 hours, Medic 2 arrived at the landing zone and the injured fire fighter was transferred from Medic 2 to the air ambulance. The patient was flown to a metropolitan Level 1 Trauma Center.

At 2255 hours, Medic 1 arrived on scene and initiated patient care on the police officer. At 2257, Medic 3 arrived on scene. The crew from Medic 3 split and the fire fighter/EMT went with Medic 1 and the fire fighter/paramedic went with Medic 2. Due to the length of response (30+ minutes) of the 2^{nd} "Med Flight" helicopter, the decision was made to transport the police officer by ground to a metropolitan Level 1 Trauma Center. The police officer was transported at 2318 hours and arrived at the trauma center at 2332 hours.

The gas company arrived on scene at approximately 2315 hours to control the natural gas leaking from the damaged gas meter. Once this was completed, the police department initiated their investigation. The gas company returned on March 20 during daylight hours to complete the repairs and install a new gas meter (See Photo 3).

Once "Command" was terminated, Battalion 2 started calling off-duty personnel to report to work to relieve the entire on-duty shift.



Photo 3. The natural gas meter which was replaced by the utility company. The original gas meter which was struck and damaged by the driver of the SUV was not protected as shown in this picture. The utility company arrived on scene during the incident, controlled the leak, and then returned the next day to install the new meter.

NIOSH Photograph

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 fatalities:

- Actions of the van driver
- Initial single vehicle crash involving damaged/leaking natural gas meter
- Inadequate protection of the highway/roadway work area
- Fire fighters and police officer standing in close proximity to moving traffic
- Inadequate traffic management
- Lack of procedures for controlling a damaged/leaking natural gas meter.

Cause of Death

The victim died of multiple injuries caused by the trauma of being struck by a vehicle. The manner of death was listed as homicide.

Recommendations

Recommendation #1: Develop pre-incident plans regarding deployment to traffic incidents, scene safety, situational awareness, and traffic control for highway/roadway emergency work zones.

Discussion: Highway/Roadway incidents are high risk events regardless of the frequency in which they occur. When responding to an incident on any type of highway/roadway, fire fighters and other first responders must ensure for their personal safety as well as others plus the individuals they are trying to assist and help. Complacency, redundancy, and lack of situational awareness are issues that all responders must avoid when dealing with highway/roadway incidents. Safety of the emergency responders, care of the injured, protection of the public, protection of the environment, and clearance of the traffic lanes should all be the priority concerns of the Incident Commander operating at the scene of a highway/roadway incident.²

There are various types of highways/roadways that a fire department responds to in their response area. Examples can be a city street (2 or 4 lanes), county road (2 or 4 lanes), a divided highway (4 lanes), an expressway, freeway, turnpike, or interstate which are commonly known as limited access highways. The fire department has to plan how and what resources to deploy to these various types of highways/roadways.

From a pre-incident planning process, the fire department has to consider the type of responses that may occur on these various highways/roadways such as motor vehicle crashes, vehicle fires, brush fires, hazardous materials incidents, and any other conceivable type of incident. The intent is to plan

on what resources will respond in order to mitigate the problem which has occurred and how to safely protect fire fighters and the other first responders. $\frac{3}{2}$

The primary objectives for any operation at the scene of a highway incident are to:

- establish a safe operating area to prevent injuries to emergency workers;
- provide emergency care and transportation of the sick or injured;
- establish water supply, as needed;
- protect the environment;
- restore normal traffic flow, as soon as possible;
- keep as many traffic lanes open as possible;
- preserve evidence for investigators;
- use the Incident Command System to manage the incident. $\frac{4}{2}$

These objectives also are included in the National Unified Goal (NUG) for Traffic Incident Management which was developed by the National Traffic Incident Management Coalition.⁵ The primary objective is to protect the first responders in order to allow them to safely operate at the incident scene. This process starts with the first arriving officer making the decision as to what lanes to close or if the highway/roadway needs to be completely closed. This is based upon the risk assessment for ensuring that first responders have a safe work area to operate.

All responders should understand and appreciate the high risk they are exposed to when operating in or near moving vehicle traffic. At every highway/roadway-related emergency scene, personnel are exposed to passing motorists of varying driving abilities. Situational awareness can be defined as genuinely heightened consciousness or cognizance of what is currently developing or occurring around you. It is crucial that first responders maintain good situational awareness during all emergencies, especially highway/roadway incidents to better protect themselves and those around them.

Fire fighters and other first responders need to be constantly reminded to use caution and common sense while operating on highways/roadways. Company officers need to remind fire fighters to exit the apparatus safely and, above all else, to keep an eye out for any potential hazards. In some cases, additional officers may be needed to provide sufficient supervision of tasks, scene safety, and scene management.

Approaching vehicles may be driven at speeds from a creeping pace to well beyond the posted speed limit. Some of these vehicle operators may be vision impaired, under the influence of alcohol and/or drugs, or have a medical condition that affects their judgment or abilities. In addition, motorists may be completely oblivious to first responders' presence due to distractions caused by cell phone use, loud music, conversation, inclement weather, and terrain or building obstructions. Approaching motorists will often be looking at the scene and not the roadway in front of them. Nighttime incidents requiring personnel to work in or near moving traffic are particularly hazardous. Visibility is reduced and driver reaction time to hazards in the roadway is slowed. $\frac{4}{2}$

To ensure that first responders maintain situational awareness, they must understand the strategy and Incident Action Plan which must be communicated from the Incident Commander at the beginning of the incident and maintained throughout duration of the incident. This ensures for effective strategic, tactical, and task level management, plus all tasks being conducted are moving towards a successful outcome for the incident. At highway/roadway incidents, this is essential due to the fact that the potential for something to go wrong can occur very quickly. Each first responder is responsible for their safety plus the personnel they are working with. This protects against complacency and tunnel vision. The operations at a highway/roadway incident must be reassessed continuously, especially as incident objectives are met, as additional resources arrive, and/or resources are released from the incident. $\frac{2}{2}$

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 crewmembers:

- never trust the traffic;
- engage in proper blocking procedures (which means using the positioning of fire apparatus as a protection barrier for fire fighters and other first responders when working on a highway/roadway);
- wear high visibility reflective vests including turnout gear (as necessary);
- reducing white lights and warning lights (to prevent possible motorist vision impairment);
- use traffic cones and flares. ⁴

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, Paragraph 8.7.7 states, "the first arriving officer shall ensure that traffic is controlled before addressing the emergency operations". ⁵ The first arriving officer must conduct a complete and thorough scene size-up to determine the risk to the fire fighters and police officer working this incident.

The location of the incident, moving traffic, the duration of this incident, the severity of natural gas leak, and the response time of the utility company to control the natural gas leak, were all factors indicating the roadway should have been closed. After ensuring that the victim of the single vehicle crash was not injured, the captain and fire fighter attempted to secure the leak from around the natural gas meter. Due to the condition of the meter and piping, the fire fighters were unable to secure the natural gas leak. While waiting on the response of the natural gas company, the captain and engineer moved to the shoulder of the roadway to talk with the police officer. There were no steps taken to provide traffic control management of the incident scene as described in this recommendation. The only traffic control was the parked police vehicle (Police Unit 361) and Engine 4 with the warning lights activated. Incident management, situational awareness, traffic control, and effective scene safety are the keys to ensuring for a safe outcome.

Recommendation #2: Develop and implement standard operating procedures (SOPs) for highway/roadway incidents including deployment protocols within the department's jurisdiction.

Discussion: A standard operating procedure (SOP) is an organizational directive that establishes a standard course of action.⁶ Established standard operating procedures allow officers and fire fighters

to make decisions more rapidly and to build confidence, knowing that the results from one operation to the next will be uniform, thus enhancing efficiency, effectiveness, and fire fighter safety. Standard operating procedures give department members a greater sense of security. Officers are able to act with a greater degree of confidence in resolving problems with standard operating procedures in place, since they have an objective basis on which to make and defend their decisions. When SOPs are the source of authority, an officer's decision is less likely to be questioned.⁶ NFPA 1500, Paragraph 4.1.2 states, "the fire department shall prepare and maintain written policies and standard operating procedures that document the organization structure, membership, roles and responsibilities, expected functions, and training requirements."²

It is essential that fire departments establish and implement a standard operating procedure that directs officers and fire fighters to manage and control incidents on a highway/roadway. The standard operating procedure must address the various types of highways/roadways that the fire department has the potential to respond to in their community. Ensuring the safety of firefighters and other emergency responders while working on the scene of a highway/roadway incident merits the development and use of a standard operating procedure. The standard operating procedure reminds fire fighters of actions to follow on the scene and ensures that all first responders know what actions to expect from others.

Fire departments deliver a full range of fire, EMS, and special operations services to handle virtually every type of emergency that may occur within their jurisdiction, community, or response area. Many of the emergencies that fire departments routinely respond to happen on the roadway. These include vehicle collisions, incidents involving pedestrians, 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 structure fire. In order to reduce the frequency which fire fighters are being struck by vehicles during the performance of their duties, the necessary procedures must be place to protect fire fighters and other first responders when operating at the scene of a highway/roadway incident.

A sample standard operating procedure for conducting operations at a highway/roadway incident including the safe positioning of apparatus is provided in **Appendix One**.⁸ This procedure is included, as an example, to emphasize all the necessary components that must be included when operating at an incident scene on any type of highway/roadway.

The response to this incident was initially one engine company and one police department patrol unit. The location of this incident was on a two-lane state highway with minimal lighting, involving a single vehicle crash, moderate traffic, and a significant natural gas leak. The process included evaluating (size-up) the risk to responders dealing with a highway/roadway incident. A standard operating procedure provides the criteria to help ensure for the safety of responders as well as the citizens involved in the incident. Based upon the potential risks encountered at the incident scene, closing the roadway should have been considered. Another part of the development of an SOP coupled with pre-incident planning and a training program is to know what resources are needed to partially or completely close a highway/roadway. Another option would be to close the roadway until proper traffic control measures can be established to allow for safe traffic movement through the incident scene.

Recommendation #3: Ensure that all members receive training for conducting emergency operations at highway/roadway incidents.

Discussion: With the development and implementation of any new policy, standard operating procedure, or regulation, one of the essential elements is to ensure that training occurs. The intent is to provide a comprehensive training program for all members. This ensures the members understand the policy, standard operating procedure, or regulation and to alleviate any confusion, misinterpretation, or misunderstanding.

The Emergency Responder Safety Institute (ERSI)/Cumberland Valley Volunteer Firemen's Association, offers a curriculum entitled "Managing Emergency Incidents on the Roadway"² This is an eight-hour course which covers the following topics: fire fighter fatality and injury statistics related to highway/roadway incidents; case studies dealing with fire fighter fatalities, injuries, and near misses; types and use of personal protective equipment; federal regulations (e.g. Section 6I - *Control of Traffic through Traffic Incident Management Areas* of the Manual on Uniform Traffic Control Devices (MUTCD));¹⁰ positioning of apparatus and emergency vehicles; safety procedures for operations on highway/roadways; use of traffic signs and warning devices, use of the Incident Command System including Unified Command; pre-incident planning with law enforcement, state/local Department of Transportation, emergency medical services, tow and recovery operators, product recovery contractors; and table top exercises. This training program is available through <u>http://www.respondersafety.com</u>² at no cost.

According to the Manual on Uniform Traffic Control Devices, 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:

- Major expected duration of more than 2 hours;
- Intermediate expected duration of 30 minutes to 2 hours;
- Minor expected duration under 30 minutes.¹⁰

Major traffic incidents are typically traffic incidents involving hazardous materials, fatal traffic crashes involving numerous vehicles, and other natural or man-made disasters. These traffic incidents typically involve closing all or part of a roadway facility for a period exceeding 2 hours. It is important that all first responders have a good working relationship and compatible procedures when operating at highway/roadway incidents. At a minimum, at least one lane next to the incident lane must be closed. Additional or all traffic lanes may have to be closed if the extra lane does not provide a safe barrier. Fire apparatus and other emergency vehicles must be placed between the flow of traffic and the personnel working on the incident to act as a shield. Fire apparatus must be parked at a 30 - 45 degree angle so that the operator is protected from traffic by the tailboard. Front wheels must be turned away from the responders working highway incidents so that the apparatus will not be driven into them if struck from behind. Also, consider parking additional emergency vehicles 150 to 200 feet behind the shielding vehicles to act as an additional barrier between responders and the flow of traffic.

Advanced warning devices and transition areas are a means by which fire fighters and other first responders 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.⁹ Note: The National Fire Protection Association is currently developing a proposed standard, NFPA 1091, Standard for Traffic Control Incident Management Professional Qualifications, for personnel who operate on or about roadways mitigating an incident.

NFPA 1500, Paragraph 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:

- fluorescent and retro-reflective warning devices such as traffic cones;
- Federal Highway Administration approved 48-inch by 48-inch retro-reflective signs stating "Emergency Scene Ahead" (with directional arrow overlay);
- illuminated warning devices such as highway flares; (*Note: at this incident, flares would not have been utilized due to the natural gas leak.*)
- other devices appropriate to warn oncoming traffic of the emergency operations.⁶

The importance of understanding standard operating procedures and the pre-incident planning process for highway/roadway emergency operations is essential for the safety of all first responders. All fire fighters have to understand the risks involved when conducting emergency operations on any highway/roadway. The intent is to identify and reduce the hazards encountered by fire fighters and first responders at highway/roadway incidents. The training process will allow for members to determine the correct course of action at an incident scene including the proper staffing, appropriate agencies needed to respond, and deployment of resources to effectively control traffic until the situation has been mitigated. The length of this incident (2+ hours) is another justification for completely closing the roadway and allowing the hazard to be mitigated.

Recommendation #4: Develop and implement standard operating procedures for the response to incidents involving natural gas.

Discussion: As with the development and implementation of the standard operating procedure for operations at highway/roadway incidents, a fire department must also have a comprehensive standard operating procedure in place for response to natural gas emergencies. The procedure should address the various types of scenarios that the fire department can encounter such as ruptured gas line, damaged or leaking gas meter, leaking appliances, explosion, or other situations or equipment involving natural gas.

The procedure should address the fire department's location of apparatus, evacuation area, removal of ignition sources, use of personal protective clothing and equipment, hoseline operations and water supply, operate upwind of the leak if possible, air or atmospheric monitoring, notification of the utility company, and the responsibilities of the utility company. $\frac{11}{11}$

Natural gas is a naturally occurring, largely hydrocarbon gas, recovered from wells. Natural gas is mostly methane, with lesser amounts of nitrogen, ethane, propane, and traces of butane, pentane, carbon dioxide and oxygen. The mixture can range from 72% - 95% methane and 3% - 13% ethane, less than 1% - 4% propane and less than 1% - 18% nitrogen. This combination makes natural gas lighter than air; having a vapor density that ranges between 0.59 and 0.72. Natural gas in its natural state will not have a readily identifiable odor or color.¹² To increase the detectability of natural gas, an odorant blend is added, which contains t-butyl mercaptan, triophane, or some other mercaptans to give natural gas an identifiable odor. This odorant is added at the local distribution station (natural gas in long-distance transmission pipelines usually is not odorized) where it is hoped that escaping gas will be detected before its' concentration in air reaches the combustible range (LEL is 3.9% - 4.5% and the UEL is 14.5% -15%). Enough odorant is added to make it easily recognized at concentrations of 0.5% gas in air. The stronger the odor the higher the gas concentration, however, extended periods of time being exposed to the odor will have a tendency to fatigue the sense of smell. Also, some of the odor may be removed if the gas is being passed through the soil. Note: the intensity of the odor should not be used to estimate the concentration of gas. With any natural gas leak, assume the situation to be dangerous, start the evacuation and ventilation process as necessary and call for the utility company.

The first arriving officer should always look at the "big picture" and consider the various hazards fire fighters may encounter when operating at natural gas incidents. The first arriving officer or Incident Commander should notify the utility company of a confirmed gas leak and consider the following questions when sizing-up an incident and deciding whether to evacuate a building or an area:

- Where is the leaking gas going?
- Where is the gas collecting?
- Is it approaching the explosive range?
- What problems and hazards will be present if the gas ignites?
- Are fire fighters, civilians, and apparatus in a safe location?
- What can go wrong?
- What additional resources, information, and equipment are needed to safely control and mitigate the situation? ¹¹

Based upon this assessment, several actions should have occurred. The first issue is that there is an identified need for additional staffing whether to increase the staffing on Engine 4 or request a full alarm structural assignment. With the minimum staffing of two, there is no initial rapid intervention crew (IRIC) or rapid intervention crew (RIC) when working in or near an immediately dangerous to life and health (IDLH) atmosphere.⁷ Both fire fighters should have donned turnout gear and self-contained breathing apparatus when attempting to control a leaking natural gas meter. A protective hoseline $(1\frac{1}{2})^{\circ}$ or $1\frac{3}{4}$ hoseline) should have been stretched to provide fire protection in the event that the natural gas ignited. Procedures from the responding natural gas company request that fire fighters do not attempt to control a natural gas leak based upon the condition of the meter and piping. They request that the fire department secure the area, establish a hot zone, and wait upwind for the personnel from the natural gas company.

The captain and engineer attempted to control the leak, but were unsuccessful due to the condition of the natural gas meter. The meter was completely severed from the piping about $8^{\circ} - 10^{\circ}$ below ground level. Witness reports stated that the leaking natural gas was making a loud noise and blowing straight up in the air. Neither the captain nor the engineer was wearing turnout gear or SCBA when operating around the leaking natural gas meter. The fire department's inability to control the leaking natural gas, the amount of natural gas escaping from the broken meter, and the proximity to the highway/roadway are the necessary justifications for securing the immediate area and closing the highway.

Recommendation #5: Utilize the principles of the incident management system for effective command and control of highway/roadway incidents.

Discussion: Emergency operations involving highways/roadways incidents can require a significant amount of resources, require the response of numerous agencies, can be of significant duration, and require effective and efficient incident management. The intent of this process is to ensure the early implementation of "Command" and a smooth escalation of the organization to meet the demands of any highway/roadway incident regardless of the size and complexity. ¹³ On highway/roadway incidents, experience has proven a critical necessity of integrating response agencies into one operational organization, managed and supported by one command structure.

The *Functions of Command* define standard activities that are performed by the Incident Commander to achieve the tactical priorities. The *Functions of Command* include:

- Assume and announce command and establish an effective operating position (Incident Command Post);
- Rapidly evaluate the situation (size up);
- Initiate, maintain, and control the communications process;
- Identify the overall strategy, develop an Incident Action Plan, and assign companies and personnel consistent with plans and standard operating guidelines;
- Develop an effective ICS organization;
- Provide tactical objectives;
- Review, evaluate, and revise (as needed) the strategy and Incident Action Plan;
- Provide for the continuity, transfer, and termination of command.

The Incident Commander is responsible for all of these functions. As command is transferred, so is the responsibility for these functions. The first five (5) functions must be addressed immediately from the initial assumption of command. $\frac{13}{2}$

The first responder (law enforcement, fire service, EMS, transportation) to arrive at the scene should assume "Command" of the incident. The initial Incident Commander shall remain in command until command is transferred or the incident is stabilized and terminated. The first-arriving responder on the scene must initiate whatever parts of the Incident Command System are needed to effectively manage the incident scene. The exact actions undertaken will vary depending on the type or scope of the incident:

- a single-resource incident (single-patient medical incident, traffic collision with minor injuries, disabled vehicle, property damage collision, etc.) may only require that the initial Incident Commander provide a size-up report and acknowledge its arrival on the scene.
- for incidents that require the commitment of multiple companies, the first responder or member on the scene must establish and announce "Command" and initiate an incident management structure appropriate for the incident. ¹⁴

The first-arriving responder activates the command process by giving an initial size-up report. A traditional size-up report based on standard incident command practices would include the following information:

- designation of the resource arriving on the scene;
- a brief description of the incident situation (e.g., haz mat release, multivehicle crash, guardrail damage, etc.);
- verify the exact location of the incident including route identification, direction of travel, closest intersection, milepost or landmark, and lane(s) and/or shoulder affected;
- obvious conditions (hazardous materials spill, multiple patients, working fire, bridge collapse, etc.);
- brief description of action taken (e.g., "Squad 65 is setting up a temporary traffic control");
- declaration of the strategy or standardized operation (e.g., traffic stop, vehicle tow, tire change) to be used;
- any obvious safety concerns;
- assumption, identification, and location of command;
- request or release resources as required. ¹⁵

This information should then be formed into a concise verbal report that is transmitted to the agency's dispatch center or control center, as well as the other responders who are en route to the scene and monitoring the radio frequency.

Much of the confusion and conflict that has occurred between emergency responders in the past has not only been caused by a lack of understanding on what various responders roles were, but also on the failure to agree on the tactical priorities of the incident. All agencies involved in the response to incidents on the roadway should work together to develop a basic agreement on the order of tactical priorities for these operations. While the tactical priorities may vary somewhat from jurisdiction to jurisdiction, the following model is a good place to start:

- Establish Command and Communications;
- Establish a Safe Work Zone;
 - ✓ Responder Safety
 - ✓ Scene Safety
 - ✓ Traffic Safety
- Incident Mitigation;
- Facilitate Investigation/Evidence Protection;
- Vehicle/Debris/Cargo Removal;
- Incident Termination. 15

At this incident, the captain of Engine 4 assumed "Command" of this incident. Based upon his actions and communication with the Dispatch Center, his priorities were to provide care and treatment of the driver of the SUV. The driver was not injured and was removed from the hazardous area due to the natural gas leak. The next priority was to control the natural gas leak, which they were unable to control due to the condition of the gas meter and the piping. The captain contacted the Dispatch Center and made another request for the gas company to expedite their response due to the severity of the leak. No other actions were taken due to the response time of the gas company and the second crash occurred.

As stated in NFPA 1500, Chapter 8 – *Emergency Operations*, the first arriving officer must ensure traffic has been properly controlled before addressing emergency operations.¹ This should occur simultaneously as the Incident Commander will start providing scene management plus making tactical decisions. Moreover, NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* Paragraph 5.2.2.1.1 states "a minimum of four fire fighters per engine company whose functions are to pump and deliver water and perform basic fire-fighting operations at fires, including search and rescue."¹⁶

With staffing of only two members on Engine 4, the officer is required to function as the Incident Commander (strategically), plus function on the tactical level and conduct task level work. To ensure appropriate incident management for similar future incidents, the fire department should provide additional staffing to Engine 4 or dispatch adequate resources to all highway/roadway incidents so the Incident Commander can strictly focus on incident management.

References

- 1. Weather Underground [2011]. <u>http://www.wunderground.com/history/airport/KLRF/2012/3/19/DailyHistory.html?req_city=Jacks</u> <u>onville&req_state=AR&req_statename=Arkansas</u>. Date accessed: May 22, 2012.
- 2. District of Columbia Fire and EMS Department [2009]. Highway Safety Plan, *Driving Bulletin* #7, June 3, 2009; Washington, D.C: District of Columbia Fire and EMS Department.
- US Fire Administration [2012]. Traffic Incident Management Systems. Emmitsburg, MD: Federal Emergency Management Agency, US Fire Administration. <u>http://www.usfa.fema.gov/downloads/pdf/publications/fa_330.pdf</u>
- 4. NOVA Region [2007]. Book 1: Operating Procedures for Highway Incidents, Fire and Rescue Departments of Northern Virginia, September 2007. Fairfax, VA: Fire and Rescue Departments of Northern Virginia, c/o Northern Virginia Regional Commission.
- ERSI [2008]. National Unified Goal for Traffic Incident Management. Cumberland Valley Volunteer Firemen's Association, Emergency Responder Safety Institute: <u>http://www.respondersafety.com/NUG.aspx</u> Date accessed: November 18, 2012.
- 6. Cook, J. [1999]. Writing Standard Operating Procedures and Guidelines. <u>http://www.fireengineering.com/articles/print/volume-152/issue-8/features/writing-standard-operating-procedures-and-guidelines.html</u>. Date Accessed: June 5, 2012.
- 7. NFPA [2007]. NFPA 1500, standard on fire department occupational safety and health program. 2007 ed. Quincy, MA: National Fire Protection Association.
- ERSI [2009]. Model standard operating guideline (SOG) for operations and safe positioning of apparatus in or near traffic. By Moore, R.: Cumberland Valley Volunteer Firemen's Association, Emergency Responder Safety Institute: <u>http://www.respondersafety.com/Download.aspx?DownloadId=2c3b900d-bf89-4142-acee-063397f372aa</u> Date accessed: July 5, 2012.
- 9. ERSI [2008]. Managing Emergency Incidents on the Roadway. Cumberland Valley Volunteer Firemen's Association, Emergency Responder Safety Institute: <u>http://www.respondersafety.com/Download.aspx?DownloadId=e5b4282f-d3c3-413c-9040-1539bab65963</u> Date accessed: July 5, 2012.
- FWHA [2009]. Part 6, Temporary traffic control elements. Manual on uniform traffic control devices (MUTCD). 2009 ed. Washington, DC: U.S. Department of Transportation, Federal Highway Administration [<u>http://mutcd.fhwa.dot.gov/pdfs/2009/part6.pdf</u>]. Date accessed: July 6, 2012.

- 11. Phoenix, AZ Fire Department [1997]. Phoenix Regional Standard Operating Procedures, M.P. 204.05, Natural Gas Emergencies. <u>http://phoenix.gov/webcms/groups/internet/@inter/@dept/@fire/documents/web_content/074764.p</u> <u>df</u> Date accessed: July 6, 2012.
- 12. Montagna, F. [2004]. Natural Gas Hazards. <u>http://www.fireengineering.com/articles/print/volume-157/issue-11/features/natural-gas-hazards.html</u> Date Accessed: July 12, 2012.
- 13. NFPA [2008]. NFPA 1561, standard on emergency services incident management system. 2008 ed. Quincy, MA: National Fire Protection Association.
- FIRESCOPE [2007]. Incident Command System for Fire Department Structure Fire Operations, Firefighting Resources of California Organized For Potential Emergencies (FIRESCOPE). Riverside, CA. FIRESCOPE.
- 15. NFSIMSC [2004]. IMS Model Procedures Guide for Highway Incidents, International Fire Service Training Association (IFSTA), Fire Protection Publications: National Fire Service Incident Management System Consortium, Stillwater, OK. Available from IFSTA/Fire Protection Publications at (800) 654-4055 or <u>www.ifsta.org</u>.
- 16. NFPA [2010]. NFPA 1710, standard for the organization and deployment of fire suppression operations, emergency medical operations, and special operations to the public by career fire departments 2010 ed. Quincy, MA: National Fire Protection Association.

Investigator Information

This incident was investigated by Murrey E. Loflin, Investigator and Tim Merinar, Safety Engineer 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, Chairman of NFPA 1091, *Standard for Traffic Control Incident Management Professional Qualifications* and Brad Sprague, A Sergeant with the Illinois State Police and a Captain with the Minooka, IL Fire Protection District. A technical review was also provided by the National Fire Protection Association, Public Fire Protection Division.

Additional Information

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

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

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

National Fire Service Incident Management System, *Model Procedures Guide for Highway Incidents,* Available from IFSTA/Fire Protection Publications at (800) 654-4055 or <u>www.ifsta.org</u>.

National Traffic Incident Management Coalition http://ntimc.transportation.org/Pages/default.aspx

United States Department of Transportation, Federal Highway Administration http://ops.fhwa.dot.gov/eto_tim_pse/about/tim.htm

United States Fire Administration, *Traffic Incident Management System*, FA-330, March 2012, http://www.usfa.fema.gov/downloads/pdf/publications/fa_330.pdf

Disclaimer

Mention of any company or product does not constitute endorsement by the National Institute for Occupational Safety and Health (NIOSH). In addition, citations to Web sites external to NIOSH do not constitute NIOSH endorsement of the sponsoring organizations or their programs or products. Furthermore, NIOSH is not responsible for the content of these Web sites.

Appendix One

Sample Standard Operating Guideline

Operations for Highway/Roadway Incidents and Safe Positioning of Fire Apparatus and Vehicles

Purpose: To provide a systematic method of conducting emergency operations at highway/roadway incidents.

Scope: These operations shall apply to, and be used by, all Fire Department members involved in emergency and non-emergency operations on highway/roadway incidents and by those agencies that respond to support Fire Department operations.

Overview: This standard operating guideline identifies the necessary actions which needed to be taken while operating at the scene of an incident on a highway/roadway. Additionally, this SOG covers vehicle positioning practices for XYZ Fire Department apparatus and emergency vehicles that provides maximum protection and safety for personnel operating in or near moving vehicle traffic.

This guideline emphasizes efforts to maintain lanes of moving traffic around the incident scene to minimize the traffic queue and the inherent probability of secondary collisions. Efforts to complete safe and efficient clearance of the incident scene in as short a timeframe as possible are recommended.

It shall be the policy of the **XYZ Fire Department** to initially position apparatus and other emergency vehicles at an incident on any street, road, highway or expressway in a manner that best protects the incident scene while at the same time providing for traffic movement past the incident scene as much as reasonably possible. Such positioning shall afford protection to fire department personnel, law enforcement officers, tow or recovery service operators, and other emergency personnel while working in or near moving traffic.

All personnel should understand and appreciate the significant risk that personnel are exposed to when operating *in* or *near* moving vehicle traffic. First responders should always operate within a protected environment at any roadway incident.

Always consider moving vehicles as a threat to your safety. At every roadway emergency scene, personnel are exposed to passing motorists of varying driving abilities. First responders must accept that motorists approaching the incident scene on the roadway may be a 'D' driver; drunk, drugged, drowsy, distracted, or just plain dumb. It is the 'D' driver that may be completely oblivious to your presence due to distractions or impairments. Distracted motorists will often be looking at the scene and not the roadway in front of them where you might be operating. Assume that all approaching traffic is a 'D' driver and is out to get you until proven otherwise.

Nighttime incidents and inclement weather conditions are particularly hazardous. Visibility is reduced and driver reaction time to hazards in the roadway is slowed. Adjust operations accordingly.

Terminology

Advance Warning: notification procedures that advise approaching motorists to transition from normal driving status to that required by the temporary emergency traffic control measures ahead of them.

Block: positioning a fire department apparatus on an angle to the lanes of traffic creating a physical barrier between upstream traffic and the work area. Includes 'block to the right' or' block to the left'.

Buffer Zone: the distance or space between personnel and vehicles in the protected work zone and nearby moving traffic.

Downstream: the direction that traffic is moving as it travels away from the incident scene.

Flagger: fire department member assigned to monitor or direct approaching traffic and activate an emergency signal if the actions of a motorist do not conform to established traffic control measures in place at the highway scene

Linear: positioning a fire department apparatus parallel to or within a travel lane or shoulder of a roadway. Linear positioning only creates a physical barrier within that lane or shoulder of the roadway.

Taper: the action of merging lanes of moving traffic into fewer moving lanes.

Temporary Traffic Control Zone: the physical area of a roadway within which emergency personnel perform their fire, EMS and rescue tasks at a vehicle-related incident.

Transition Zone: the lanes of a roadway within which approaching motorists change their speed and position to comply with the traffic control measures established at an incident scene.

Upstream: the direction that traffic is traveling from as the vehicles approach the incident scene.

"Move It" Incidents

All emergency personnel are at great risk of injury or death while operating in or near moving traffic. There are several specific *tactical procedures* that should be taken to protect all responders and emergency service personnel at the incident scene including:

- Consider that all approaching drivers are 'D' drivers;
- Establish an initial "block" with the first arriving emergency vehicle or fire apparatus while the initial size-up survey is complete;
- Always wear high visibility, florescent and reflective garments (vest or jacket) during roadway operations. When full protective NFPA compliant clothing is required by department SOP, high-visibility vests must be worn over structural turnout gear except for members combatting a fire situation or dealing directly with hazardous materials.
- All fire department members must wear structural firefighting helmet with chinstrap donned properly.

- Operators of emergency vehicles at the scene should complete 'light shedding'; turning off all lights such as vehicle headlights, forward-facing warning lights, or spotlights that might create vision impairment to approaching motorists at nighttime incidents.
- Employ the 'Move It' or 'Work It' strategy. Determine if vehicles involved can be moved out of the travel lanes to an off-roadway location. Moving to an off-roadway location improves responder safety minimizes congestion, and assists with safe, quick clearance; the "Move It" strategy.
- If vehicles can be moved out of the travel lanes of the roadway, attempt to clear the travel lanes in less than 30 minutes; Minor duration incident.

"Work It" Incidents

The following are benchmarks for safe positioning of **apparatus** and **emergency vehicles** when the crash-damaged vehicle cannot be moved out of the travel lanes of the roadway and crews must work the incident at the location found upon arrival. If incident is a 'Work It' situation, establish "Command" according to the Incident Command System protocols, employ upstream advance warning and temporary traffic control transition measures to warn approaching motorists, and attempt to reduce their vehicle speed. Incident duration is anticipated to exceed 30 minutes. The process should be:

- Position first-arriving apparatus to protect the scene, patients, and emergency personnel.
 - ✓ Initial apparatus placement should create an initial incident area protected from traffic approaching in at least one direction. Intersections or where the incident may be near the middle lanes of a multi-lane roadway require two or more sides of the incident to be protected.
 - ✓ Angle apparatus on the roadway with a "block to the left" or a "block to the right" to create a physical barrier between the crash scene and approaching traffic. Block at least one additional traffic lane more than that already obstructed by the crashed vehicle(s); obstructed Lane + 1 strategy. Shoulder of the highway can be counted as a lane.
 - ✓ The front wheels of blocking vehicles should be turned away from the downstream work area;
 - ✓ For first arriving fire department units where a charged hoseline may be needed, block so that the pump panel is downstream, on the opposite side of on-coming traffic. This will protect the pump operator.
- Ambulances should be positioned within the protected work area and have their rear patient loading area angled away from the nearest lanes of moving traffic
- Additional responder vehicles and personnel working the incident should either support advanced warning efforts or be positioned within the protected area created by the blocking apparatus.
- Command shall stage unneeded emergency vehicles off the roadway, place them in a Staging area on the downstream side of the incident, or return these units to service.
- Lanes of traffic shall be identified numerically as "Lane 1", "Lane 2", etc., beginning from the left to the right when considered from the motorist's point of view driving in those lanes.

- Traffic cones or cones with flares alongside should be deployed upstream to increase the advance warning for approaching motorists. Cones and flares identify but only suggest the transition and tapering actions that are requested of the approaching motorist.
- Personnel shall place cones and flares as well as shall retrieve cones while <u>facing</u> oncoming traffic. A Buddy system is recommended for deployment and retrieval.
- Adequate advance warning to approaching motorists should be put in place using flares or traffic cones deployed at intervals of no greater than 40' apart upstream of the blocking apparatus. The furthest traffic cone that begins the taper and closing of a travel lane should be positioned upstream along the edge or shoulder of the roadway.
- Additional personnel may extend the advanced warning area by placing additional emergency vehicles, traffic cones, flares, deployable signs, and arrow boards to build upon initial traffic control measures as the incident duration exceeds 30 minutes. Placing flares, where safe to do so, adjacent to and in combination with traffic cones for nighttime operations greatly enhances motorist warning and scene safety.
- Progressively open lanes of traffic as safely and efficiently as practical as the incident is dealt with. Once cleared of vehicles, patients and debris, opening of a traffic lane will reduce the queue and minimize the chances of secondary collisions.

Incident Command Benchmarks

The initial-arriving company officer and/or the Incident Commander must complete critical benchmarks to assure that a safe and protected work environment for emergency scene personnel is established and maintained including:

- *Assure* that the first-arriving apparatus establishes an initial block to create an initial safe work area;
- Determine if incident is a '*Move It*' situation where vehicles can be relocated out of the normal travel lanes thereby reducing responder exposure to moving traffic and improving incident clearance time.
- Determine if the incident is a '*Work It*' situation in which the vehicles involved must remain in their present location as fire, rescue, and medical activities take place.
- *Assure* that all ambulances on-scene are placed within the downstream, protected work area of the larger apparatus.

✓ *Assure* that all patient-loading into ambulances is done from within a protected work area.

- The initial company officer and/or Incident Commander must operate as the *Safety Officer* until this assignment is delegated.
- Command shall assure that *'light-shedding'* protocols including "Opticom", strobe systems, and high-beam headlights are turned OFF and that other emergency lighting remains ON as necessary.

Emergency Crew Personnel Benchmarks

Listed below are benchmarks for safe actions of individual personnel when operating <u>in</u> or <u>near</u> moving vehicle traffic.

- Always maintain an acute *awareness* of the high risk of working in or near moving traffic. They are out to get you!
- Never trust the 'D' driver in the moving traffic that is approaching you.
- Always look before you move!
- Avoid turning your back to moving traffic.
- Personnel arriving in crew cabs of fire apparatus should exit and enter the apparatus from the protected, downstream side, away from moving traffic.
- Officers, apparatus operators, crew members in apparatus with individual jump seat configurations and all ambulance personnel must exit and enter their units with extreme caution remaining alert to moving traffic at all times.
- Protective clothing, high-visibility safety garment, and helmet with chin strap in position should be donned prior to exiting the emergency vehicle.
 - ✓ During normal daylight conditions, don helmet and high visibility garment or NFPA compliant turnout PPE and high-visibility vest when operating *in* or *near* moving traffic.
 - ✓ During dusk to dawn operations or when ambient lighting is reduced due to inclement weather conditions, don helmet, full NFPA compliant protective clothing and high-visibility vest.
 - ✓ All staff personnel and any other personnel arriving on an apparatus or emergency vehicle should don assigned helmet and high-visibility garment prior to exiting their vehicle.
- Always look before opening doors and stepping out of apparatus or emergency vehicle into any moving traffic areas. When walking around fire apparatus or emergency vehicle, be alert to your proximity to moving traffic.
 - ✓ Stop at the corner of a blocking position unit, check for moving traffic, and then proceed along the unit remaining as close to the emergency vehicle as possible.
 - ✓ Maintain a 'reduced profile' when moving through any area where a minimum 'buffer zone' condition exists.

High-Volume, Limited Access Highway Operations

High-volume, limited access divided highways include expressways, turnpikes, freeways, tollways, and other multi-lane roadways within the response area. A desire to keep the traffic moving on these high-volume thoroughfares is inherent in all operations. When in the judgement of Command (or Unified Command), it becomes essential for the safety of operating personnel and the patients involved, any or all lanes, shoulders, and entry/exit ramps of these limited access highways can be completely shut down. This, however, should rarely occur and should be for as short a period of time as practical.

Unique Safe Positioning procedures at locations such as expressway, freeway, and limited-access, high- volume multi-lane roadway incidents include:

- Travel lanes are typically 12 feet in width. First-arriving engine company apparatus should establish an initial Lane +1 block position.
- A large and heavy second fire apparatus such as a ladder truck shall be automatically dispatched to all incidents on all limited-access, high-volume expressways, tollways, freeways, turnpikes, and highways.
- The primary assignment of this second unit shall be to;
 - ✓ Establish an upstream block occupying a minimum of two 12' lanes plus the paved shoulder of the highway or blockage of three 12' driving lanes of traffic upstream of the initial block provided by the first-due apparatus.
 - ✓ The position of this apparatus shall take into consideration all conditions that might limit sight distance of the approaching traffic including ambient lighting conditions, weather-related conditions, road conditions, curves, bridges, hills and over- or underpasses.
 - ✓ Traffic cones and/or cones illuminated by flares and the NFPA-compliant retro-reflective pink Emergency Scene Ahead deployable sign should be placed upstream of the second vehicle by its crew at the direction of the company officer.
 - ✓ Traffic cones on limited-access, high-volume roadways can be placed at 40' intervals with the furthest cone and or flare approximately 200 feet "upstream", to allow adequate warning to drivers. When incident duration exceeds two hours, advance warning efforts should be as compliant with the Manual of Uniform Traffic Control Devices (MUTCD) requirements as possible.
 - ✓ A flagger/spotter person should be positioned if available to monitor the response of approaching motorists as they are directed to transition to a slower speed and taper into merged lanes of traffic.
 - Command should be notified by this flagger/spotter on the incident operating channel of any approaching traffic that is not responding to the speed changes, transition, tapering and merging directions.
 - ✓ Flagger/spotter should have the capability of activating a pre-determined audible warning to operating personnel of a non-compliant motorist approaching.
- Vehicles from law enforcement and transportation departments can be used to provide additional blocking of additional traffic lanes as needed as incident duration exceeds 30 minutes; MUTCD minor duration.
- When the incident duration exceeds 30 minutes, it becomes an Intermediate duration incident as defined by the MUTCD. During this period of time, efforts should evolve around clearing the scene as expeditiously as possible. For extended duration incidents such as hazardous materials

situations, Command should request appropriate traffic incident management personnel and resources. When the lane or road closure exceeds two hours in duration, MUTCD-compliant traffic control measures should be in place. This can include traffic control center protocols, transportation department arrow board trucks, road detours, changeable message sign notifications, media contacts, etc., as appropriate.

- Fire Department Incident Commander should establish a liaison with the Police Department supervising officer as soon as possible. This Unified Command team will jointly coordinate activities and determine how to most efficiently resolve the extended duration incident and clear the obstructed travel lanes in as safe and efficient manner as practical.
- Termination of the incident should be managed with the same aggressiveness as initial actions. Crews, apparatus, and equipment must be removed from the highway in a coordinated process to reduce exposure to moving traffic and minimize traffic congestion.

Officer's Safe Parking "Cue Card"

- "Block" with first-arriving apparatus to protect the scene, patients, and emergency personnel.
 - ✓ Block one additional lane if it is required to ensure a safe working area. If the incident is completely on the shoulder and off the travelled portion of the road it may not be necessary to close the adjacent lane. This decision should always be made based on where the responders will be working to mitigate the incident and if a protected work area can be maintained so moving traffic will not enter.
 - ✓ Block so pump panel is "downstream"
 - ✓ Block *most critical* or *highest traffic volume* direction first
 - ✓ Consider requesting additional PD assistance

• Crews wear proper PPE with Helmet

- ✓ High-visibility garments at all times
- ✓ Helmet at all times
- ✓ Full PPE plus high-visibility vest between dusk and dawn or inclement weather
- ✓ NFPA Compliant turnout gear is appropriate PPE whenever the crew is directly exposed to fire, heat, flame and/or hazardous materials.

• Establish more than adequate advance warning

- \checkmark Traffic cones at up to 40' intervals
- ✓ Deploy minimum 5 cones upstream
- ✓ Cones only "Suggest" they don't Block!
- ✓ Expand initial safe work zone as temporary traffic control devices are available

• Direct placement of ambulances

- ✓ Assure ambulances park within shadow of blocking apparatus as directed
- ✓ Lane 1 is furthest left lane, next is Lane 2, then Lane 3, etc. from approaching motorist's point of view
- ✓ Direct ambulance to "block to the right" or "block to the left" to protect loading doors

Place ambulance patient loading area facing away from closest lane of moving traffic
All patient loading into ambulances is done from within a protected work zone

• Limited access, high-volume highway incidents

- ✓ Establish initial block: minimum two lanes
- ✓ Ladder truck establishes upstream block
 - two lanes plus paved shoulder or
 - three driving lanes
- ✓ Place cones and/or cones illuminated by flares upstream of larger upstream blocking vehicle with the furthest cone approximately 200 feet "upstream" of apparatus
- ✓ Establish Flagger position
 - monitor approaching traffic
 - sound emergency signal as necessary
- ✓ Use police department and/or transportation department vehicles for additional blocking , advance warning, and traffic incident management.
- ✓ Stage additional companies off highway
- ✓ Establish liaison with Police Department to form Unified Command at scene.
- ✓ Terminate incident aggressively with safe, quick clearance strategies.

• You are the Safety Officer

✓ Consider assigning FF as upstream "Spotter" as necessary for approaching traffic;

• Night or Reduced Light Conditions

- ✓ Turn **OFF** vehicle headlights;
- ✓ Turn **OFF** "Opticom";
- ✓ Provide overall scene lighting;
- ✓ All personnel in appropriate PPE with helmets;
- ✓ Illuminate cones with flares;
- ✓ Consider additional Truck company for additional upstream "Block";

Safety Consideration: Responders, who have completed their work assignment or who are waiting for another assignment, should never congregate in an area where moving traffic might enter and endanger them. This is especially important when responders are waiting for additional resources such as a utility company or towing and recovery when there can be a delay in response.

Studies indicate that for each minute on the scene, responders are subject to an increasing likelihood of being involved in a secondary incident. Often these incidents are much more serious than the initial incident that generated the emergency response.

The Incident Commander should move these responders to a staging area away from moving traffic or an area which might endanger them.

Report # F2012-09

Career fire captain killed, fire fighter and police officer injured at the scene of a motor vehicle crash - Arkansas

Appendix 2



Sample Traffic Control Scenario