



Death in the line of duty...

A Summary of a NIOSH fire fighter fatality investigation

May 16, 2000

Volunteer Fire Fighter Died After Being Struck by an Eighteen-Wheel Tractor Trailer Truck - South Carolina

SUMMARY

On September 27, 1999, one male volunteer fire fighter died after being struck by a tractor trailer truck. He was part of a volunteer fire department (Volunteer Fire Department #2) that had been called out to provide assistance for another local volunteer fire department (Volunteer Fire Department #1). Volunteer Fire Department #1 was dispatched to a reported wreck involving a tractor trailer truck on a four-lane highway approximately 1 mile south of the North Carolina state line. The victim arrived on scene to provide assistance with traffic control for the fire fighters attending to the tractor trailer wreck. After arriving on scene, the victim was told to set up for traffic control in the southbound lanes. The victim then drove Rescue Unit 205 (R-205) northbound on the outer emergency lane of the southbound lanes, facing oncoming traffic, to an area that provided the most visibility and warning to oncoming traffic (Figure 1). Rescue Unit 205 was positioned $\frac{1}{2}$ mile north, around a curve, and in the lanes opposite the tractor trailer wreck. After being on scene for approximately 40 minutes, the fire fighters from both departments and one highway patrol officer heard a truck applying brakes and then saw the tractor trailer, in the southbound lane, fish tailing

and then coming to a complete stop. They recalled seeing the driver of that truck getting out of his vehicle and walking around the truck as if he were inspecting his truck for any damages or malfunctioning parts. The driver then got back into his truck and drove away. Approximately 2 minutes later, another truck driver heading southbound stopped and informed the fire fighters that he had just passed a fire fighter who was lying on the ground in front of a fire truck. The fire fighters from both departments then drove up the road and found that the victim and R-205 had both been struck by a motor vehicle. The victim was treated at the scene and then transported by ambulance to the local hospital. Medical treatment was continued at the hospital where he was later pronounced dead. NIOSH investigators concluded that, to minimize the risk of similar incidents, fire departments should

- *establish, implement, and enforce standard operating procedures (SOPs) regarding emergency operations for highway incidents*
- *ensure that fire fighters responding to a scene involving a highway incident or fire*



Incident Scene

The Fire Fighter Fatality Investigation and Prevention Program is conducted by the National Institute for Occupational Safety and Health (NIOSH). The purpose of the program is to determine factors that cause or contribute to fire fighter deaths suffered in the line of duty. Identification of causal and contributing factors enable researchers and safety specialists to develop strategies for preventing future similar incidents. To request additional copies of this report (specify the case number shown in the shield above), other fatality investigation reports, or further information, visit the Program Website at:

<http://www.cdc.gov/niosh/firehome.html>

or call toll free 1-800-35-NIOSH



Fatality Assessment and Control Evaluation Investigative Report #99F-38

Volunteer Fire Fighter Died After Being Struck by an Eighteen-Wheel Tractor Trailer Truck - South Carolina

first control the oncoming vehicles before safely turning their attention to the emergency in the event police have not arrived

- ***ensure that personnel park or stage unneeded vehicles off the street/highway whenever possible***
- ***ensure that personnel wear personal protective clothing that is suitable to that incident while operating at an emergency scene such as a highly visible reflectorized flagger vest (strong yellow green and orange)***
- ***ensure that personnel conducting traffic control measures use a highly visible stop/slow paddle***
- ***establish pre-incident plans for areas that have a higher rate of automobile incidents***

INTRODUCTION

On September 27, 1999, a 68-year-old male volunteer fire fighter (the victim) died after being struck by a tractor trailer truck. He was part of a volunteer fire department (Volunteer Fire Department #2) that was called out to provide assistance for another local volunteer fire department (Volunteer Fire Department #1) that had responded to a tractor trailer wreck. The wreck had occurred during a heavy rainstorm along a four-lane highway approximately 1 mile south of the North Carolina State line. (Note: Thirty-nine collisions have occurred in this 1-mile stretch of road since 1994.) National Institute for Occupational Safety and Health (NIOSH) was notified of this incident on October 5, 1999, by the United States Fire Administration. On October 27, 1999, a Safety and Occupational Health Specialist and a Safety Engineer from the Division of Safety Research traveled to South

Carolina to conduct an investigation of this incident. Meetings were held with both fire departments' officers and fire fighters who were on the scene at the time of the incident, ambulance service personnel, and a South Carolina Highway patrolman who was also present on the scene at the time of the incident. Fire department training records, standard operating procedures, traffic collision reports, and an ambulance service run report were reviewed. A site visit was conducted, and photographs of the incident scene were taken. The fire department involved in the incident consists of 30 volunteer fire fighters and serves a population of 2,500 in a geographic area of 32 square miles. The victim had 3 years of experience with the fire department. The victim had not completed basic fire fighter training and was being used as a utility person. The victim often drove and operated fire apparatus, set up equipment as needed, and assisted in traffic control. The victim had twice passed a 52-hour First Responder course and had also received 2-hour driver training that provided familiarization with departmental apparatus. The site of the incident consisted of a four-lane highway running in a north-south direction. The site of the tractor trailer wreck occurred directly across from the junction of the road on which the assisting fire department's station house is located. The site of the tractor trailer wreck is on a stretch of highway that passes through a mountainous area and is on a 6-percent grade with seven-tenths of a mile being straight and the next two-fifths of a mile before the wreck site consisting of a curve. The speed limit in that area is 55 mph.

INVESTIGATION

On September 27, 1999, at 1155 hours, a call came into Central Dispatch reporting a wreck involving a tractor trailer truck on a four-lane highway approximately 1-mile south of the North Carolina State line. The tractor trailer was heading southbound during a heavy rainstorm when the driver swerved to miss a deer, causing the truck to travel



Fatality Assessment and Control Evaluation Investigative Report #99F-38

Volunteer Fire Fighter Died After Being Struck by an Eighteen-Wheel Tractor Trailer Truck - South Carolina

across the northbound lanes and over an embankment (Diagram 1). The driver of the wrecked tractor trailer was being followed by a coworker/driver in another tractor trailer when the incident occurred. The second truck stopped and parked in the emergency lane of the southbound lanes (directly across from the initial wreck) after seeing his coworker's truck go over the embankment. The units responding from Volunteer Fire Department #1 at 1200 hours included the following: Pumper 617 with two fire fighters, Pumper 612 with two fire fighters, and an Assistant Chief on Pumper 622. Pumper 617 was the first on scene with one of the fire fighters assuming Incident Command (IC). The IC released Emergency Medical Service (EMS) from the scene at 1214 hours after it was determined that the driver of the tractor trailer was not injured. Pumpers 612 and 622 were en route at this time. The IC had Volunteer Fire Department #2 toned out to provide backup assistance and traffic control for the southbound lanes while the IC's fire fighters were busy spraying spilled diesel fuel off the road and conducting traffic control in the northbound lanes. At approximately 1220 hours, fire fighters from Volunteer Fire Department #2 arrived in privately owned vehicles (POVs), and the victim arrived in Rescue Unit 205 (R-205). The driver (victim) of R-205 was directed to provide traffic control assistance in the southbound lanes. (Note: Traffic control was needed in the southbound lanes because the tractor trailer truck was still parked in the emergency lane, partially blocking the outer southbound lane, directly across from the initial wreck.) This stretch of road has had frequent wrecks partly due to bad weather conditions, the steep grade (6%), and the curves that occur along this 1-mile stretch of road. The South Carolina Department of Public Safety reports that this 1-mile stretch of road had a total of 39 collisions resulting in 25 persons injured and 1 fatality between the years 1994 and 1999 (1999 figures are preliminary). The victim then drove R-205 northbound on the outer emergency lane of the

southbound lanes, facing oncoming traffic, to an area that provided the most visibility and warning to oncoming traffic (Figure 1). The emergency lights of R-205 were turned on at the time of the incident. It was customary for the victim to set up for traffic control in this location when responding to motor-vehicle wrecks occurring on this stretch of highway. The location of R-205 was $\frac{1}{2}$ mile north of the tractor trailer wreck and in the opposite lanes of the wreck (Diagram 1). Approximately 25 minutes after traffic control measures were established by the victim, the Lieutenant from Volunteer Fire Department #2 received a radio call from the victim who was checking to see if they had their rain gear on. Due to the heavy rainfall, the Lieutenant told the victim that they did have their rain gear on and that if he (the victim) was getting wet, to go ahead and sit in the truck (R-205). Approximately 5 minutes later, the sound of a truck applying its brakes caught the attention of the fire fighters from both departments and one highway patrol officer. They saw the tractor trailer, in the southbound lane, fish tailing and then coming to a complete stop. They recalled seeing the driver of that truck get out of his vehicle and walk around the truck as if he were looking for something that might be wrong with the truck. The driver then got back into his truck and drove away. (Note: the truck was later found and identified by the police as the vehicle that had struck R-205.) Approximately 2 minutes later, another truck driver heading southbound stopped and informed the fire fighters that he had passed a fire fighter who was lying on the ground in front of a fire truck. Fire fighters from both departments drove up to R-205 and found the victim lying face down, on his side, in front of R-205. The front of the apparatus, on the passenger's side, was severely damaged, indicating that both the fire fighter and the truck had been struck by a motor vehicle. The victim was wearing a brightly colored yellow rain suit (both pants and jacket) and a ball cap. He was not wearing an orange vest or any other type of retro-reflective material. A hand held



Fatality Assessment and Control Evaluation Investigative Report #99F-38

Volunteer Fire Fighter Died After Being Struck by an Eighteen-Wheel Tractor Trailer Truck - South Carolina

“stop/slow” traffic control sign (see Figure 2) was found on the ground near the victim, and it was broken into several pieces. Law enforcement called for an ambulance at 1257 hours. An EMT from fire department #1 turned the victim over and saw that he had massive head injuries and a flailed chest, and that he was belly breathing. The EMT inserted an airway with no resistance and began administering basic life support. An ambulance arrived on scene at 1314 hours and transported the victim to the regional hospital at 1317 hours. Time of arrival at the hospital was 1348 hours. The victim was later pronounced dead at the hospital.

CAUSE OF DEATH

The cause of death was listed by the coroner as blunt force trauma to the head.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Fire departments should establish, implement, and enforce standard operating procedures (SOPs) regarding emergency operations for highway incidents.¹⁻⁴

Discussion: Fire fighters operating at the scene of a motor-vehicle incident on a highway are in danger of being struck by oncoming motor vehicles, and SOPs can help establish proper traffic control measures when operating at the scene of motor-vehicle incidents. SOPs should include but not be limited to the following: apparatus positioning, lane closures, methods to establish a secure work area, wearing appropriate protective clothing at all times, clearing traffic lanes, and releasing the incident scene back to normal operation. At the time of the incident, the fire department did not have any standard operating procedures regarding motor-vehicle incidents and traffic control.

Recommendation #2: Fire departments should ensure that fire fighters responding to a scene involving a highway incident or fire first control

the oncoming vehicles before safely turning their attention to the emergency in the event police have not arrived.²

Discussion: When a fire company arrives on the scene of a highway emergency and there are no police to control traffic, fire fighters must first control the oncoming vehicles before safely turning their attention to the emergency. The fire department initially responding to the incident scene had set up traffic control measures in the northbound lanes but was unable to set up traffic control measures in the southbound lanes. The second fire department was called to provide assistance for traffic control and scene cleanup. R-205 had its emergency lights on at the time of the incident and the victim was using a “stop/slow” paddle. No other warning signals were being utilized for traffic control in the southbound lanes. The use of warning signals such as flares (taking into account flammable/combustible hazards), signs, cones, or flags is recommended, in addition to the operation of lights in blocking mode on the apparatus. It is recommended that warning signal devices be placed at a minimum of 350 feet behind the apparatus (further distance may be required taking into account speed limits above 45 mph, line of sight, visibility, road conditions, and weather conditions) and be positioned so they are visible to oncoming traffic for at least 350 feet beyond that. This placement allows the driver a minimum of 700 feet in which to stop a vehicle.

Recommendation #3: Fire departments should ensure that personnel park or stage unneeded vehicles off the street/highway whenever possible.³

Discussion: The highway on which this incident occurred was wet and had poor visibility due to the ongoing heavy rainstorm. The uninjured driver from the initial wreck was being questioned by a state trooper as he was sitting in his coworker’s truck.



Fatality Assessment and Control Evaluation Investigative Report #99F-38

Volunteer Fire Fighter Died After Being Struck by an Eighteen-Wheel Tractor Trailer Truck - South Carolina

The truck was parked in the emergency lane and was partially blocking the outermost southbound lane. This required traffic control measures to be established in the southbound lanes. Moving the truck from the southbound lane may have eliminated the need for traffic control measures in the southbound lane, thus reducing exposure of personnel to hazards posed by passing traffic. Traffic control measures were needed in the northbound lanes for the initial wreck and debris that were in the northbound lanes.

Recommendation #4: Fire departments should ensure that personnel wear personal protective clothing that is suitable to that incident while operating at an emergency scene such as a highly visible reflectorized flagger vest (strong yellow green and orange).^{3,6}

Discussion: The need to wear personal protective clothing such as a reflectorized, brightly colored vest arises from the fact that personnel need to be highly visible while working on the scene of a motor vehicle incident. Fire fighters could wear either the strong yellow-green or orange to provide a suitable contrast with the background. Vests that have three, 3-inch retro-reflective stripes, either orange or strong yellow-green, have been in use since 1996 and found to be highly effective. The victim did have on a brightly colored yellow rain suit but was not wearing any type of reflective material.

Recommendation #5: Ensure that personnel conducting traffic control measures use a highly visible stop/slow paddle.⁵

Discussion: The stop/slow paddle used by the victim is a standard paddle (Figure 2). Other devices such as a flashing stop/slow paddle have been used at temporary work zones on roads and found to be highly effective. Such devices increase the flagger's ability to get the drivers' attention. The paddle has high-intensity lamps mounted on the sign that can be

activated with the push of a button by the flagger.

Recommendation #6: Additionally, fire departments should establish pre-incident plans for areas that have a higher rate of automobile incidents.¹

Discussion: The need to identify areas that have higher rates of automobile incidents need to be evaluated so that standard operating procedures for emergency personnel can be tailored to the needs of particular sites (e.g., blind curves or corners, hills or sloped areas, and high-traffic areas). Fire departments can work with local highway departments to identify trouble areas and devise solutions to those problem areas in advance. This stretch of road has had frequent wrecks partly due to bad weather conditions, the steep grade (6%), and the curves that occur along this 1-mile stretch of road. The South Carolina Department of Public Safety reports that this 1-mile stretch of road had a total of 39 collisions resulting in 25 persons injured and 1 fatality between the years 1994 and 1999 (1999 figures are preliminary).

REFERENCES

1. Kipp, JD, Loflin, ME [1996]. Emergency incident risk management: a safety & health perspective. New York, NY: Van Nostrand Reinhold, Ch. 4, 12, 13.
2. Dunn, V [1992]. Safety and survival on the fire ground. Saddle Brook, NJ: Fire Engineering Books & Videos.
3. Phoenix Fire Department [1995]. M.P. 205.07A 04/95-R: standard operating procedures for safe parking while operating in or near vehicle traffic. Phoenix, AZ: Phoenix Fire Department.
4. National Fire Protection Association [1998]. NFPA 502: standard for road tunnels, bridges, and other limited access highways. Quincy, MA: National Fire Protection Association.

***Volunteer Fire Fighter Died After Being Struck by an Eighteen-Wheel Tractor Trailer Truck -
South Carolina***

5. Lighted Paddle Increases Flagger Safety. Federal Highway Administration. 10 July 1997. www.ota.fhwa.dot.gov/roadsrv/CS025.html.

6. Meeting the Customer's Needs for Mobility and Safety During Construction and Maintenance Operations. Federal Highway Administration. 02 December 1999. www.fhwa.dot.gov/quality/HP-PA9.html.

INVESTIGATOR INFORMATION

This investigation was conducted by and the report was written by Mark F. McFall, Safety and Occupational Health Specialist, and Eric R. Schmidt, Safety Engineer, Division of Safety Research, NIOSH.

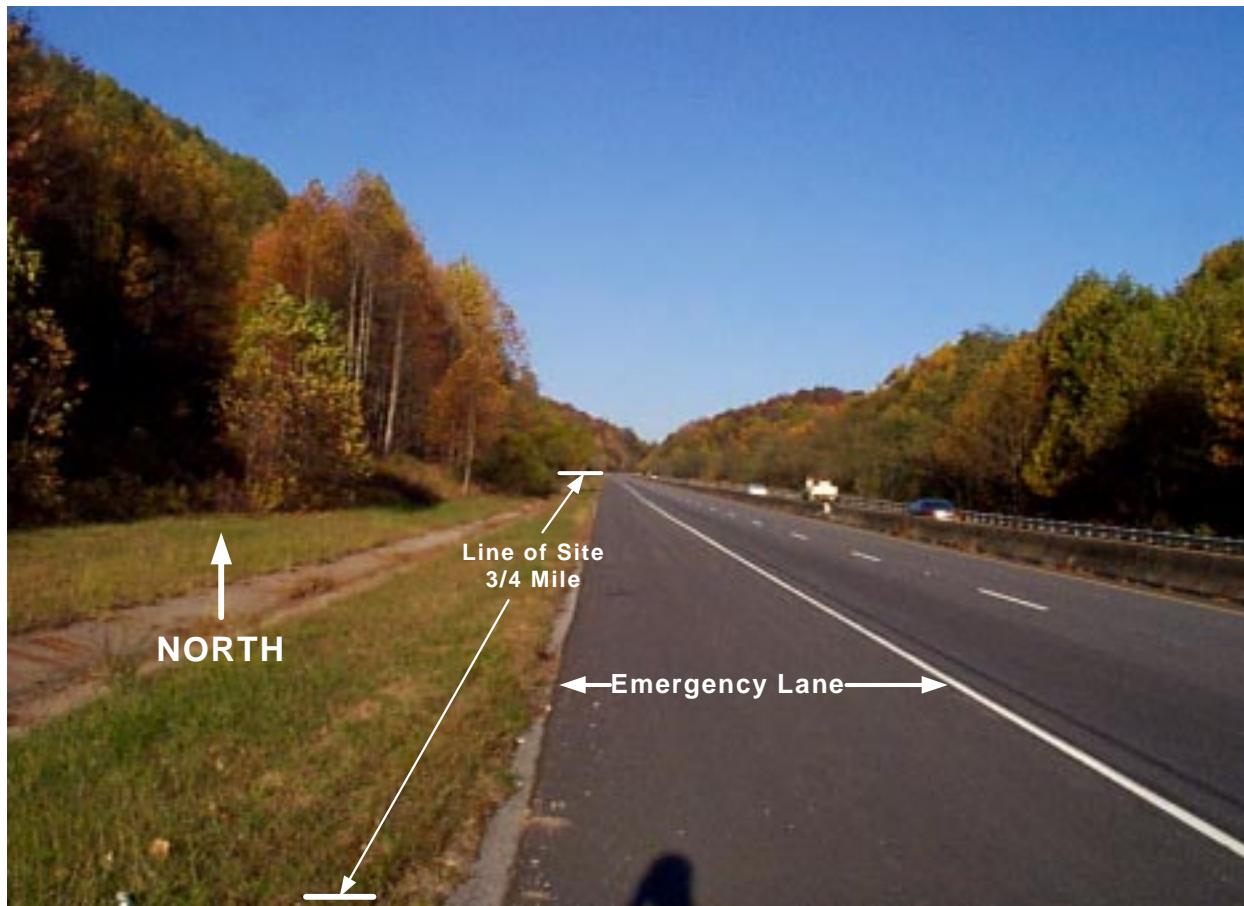


Figure 1. View Victim Had of Oncoming Traffic in Southbound Lanes



***Volunteer Fire Fighter Died After Being Struck by an Eighteen-Wheel Tractor Trailer Truck -
South Carolina***

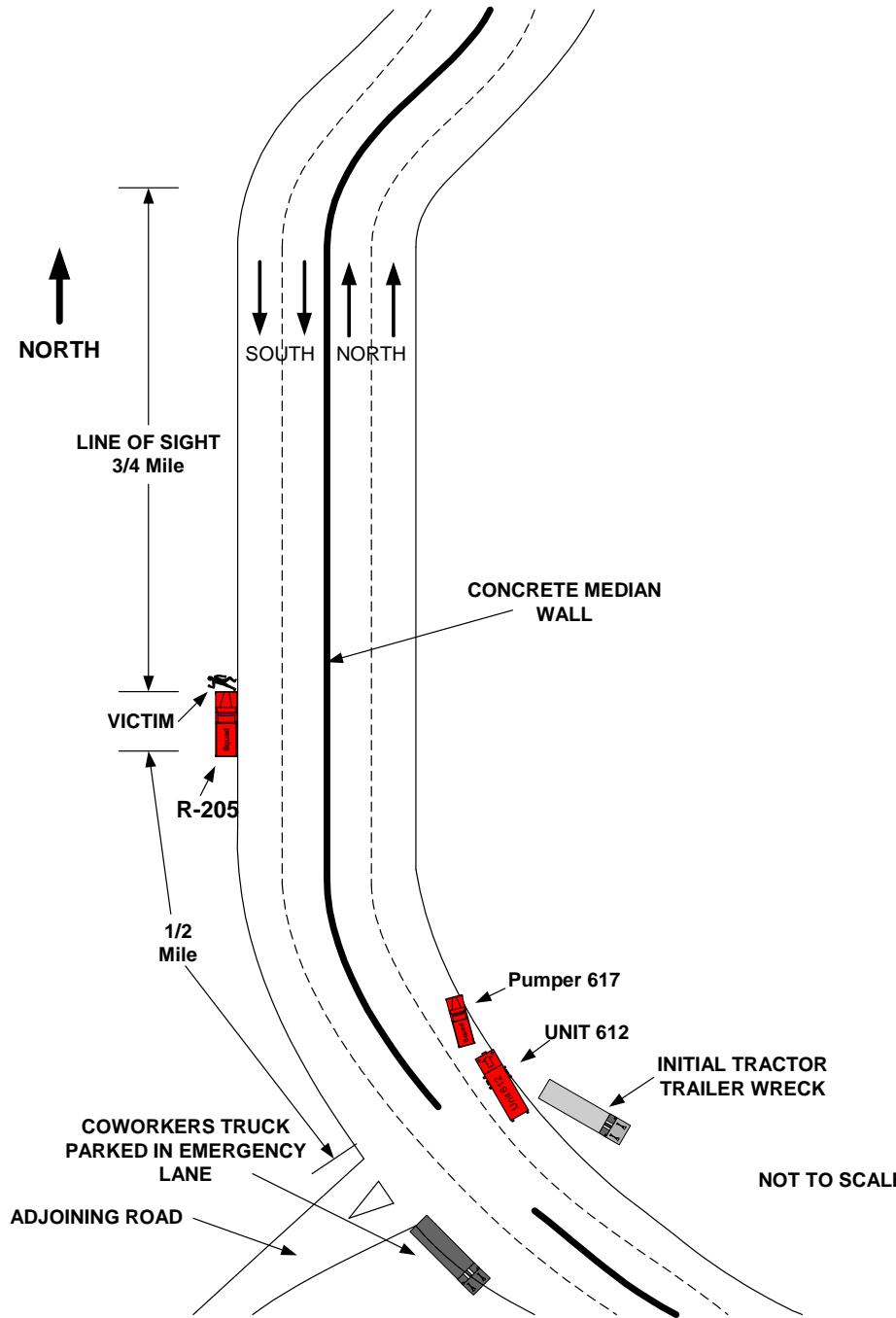


Diagram 1. Aerial View of Incident Scene



Fatality Assessment and Control Evaluation
Investigative Report #99F-38

*Volunteer Fire Fighter Died After Being Struck by an Eighteen-Wheel Tractor Trailer Truck -
South Carolina*



Figure 2. Traffic Control Sign Used by Victim (Width of Sign Is 20 Inches)