

Highway Incident Operations and Firefighter Survival
Core Elements of a Roadway Incident Safety Program (Revised JUNE 2020)

1) Roadway Incident Response Procedures (SOP/SOG)

- a. Standard Operating Procedure documented, authorized and published
 - i. Essential Components
 - 1. Terminology & Communications
 - a. Lane designations
 - b. Upstream/downstream
 - c. Block right/Block left
 - d. Unit designations
 - e. Tac channel ops, radio procedures
 - 2. Incident Command (NIMS & ICS)
 - 3. Safety of Personnel (PPE, work areas protected)
 - 4. Vehicle Placement (Proper blocking procedures, safe positioning)
 - 5. Operations specifics for different roadway environments
 - a. Roadways
 - b. Highways (high-speed, limited access)
 - c. Bridges & Tunnels
- b. Compliance with NFPA 1500 (2018) Section 9.0 on Traffic Incident Management
- c. Compliance with the Manual Of Uniform Traffic Control Devices (MUTCD) Chapter 6I – Control of Traffic through Traffic Incident Management Areas
- d. Compliance with any state, regional or local guidelines, rules or regulations
- e. Resources:
 - i. SOP/SOG Template For Fire Department “Safe Positioning While Operating or Near Moving Traffic” - www.respondersafety.com or <http://tinyurl.com/5oz8nk>
 - ii. Source for NFPA 1500 (2018) – 9.0 Traffic Incident Management - www.nfpa.org
 - iii. MUTCD Chap. 6I - <http://mutcd.fhwa.dot.gov/htm/2009/part6/part6i.htm>

2) Roadway Incident Safety training for all personnel

- a. Initial orientation for new employees before they respond to any emergency
 - i. SOP/SOGs used as a core competency
- b. Annual (minimum!) in-service training session for all personnel
 - i. Review SOP/SOGs
 - ii. Discuss strategies & tactics
 - iii. Lessons from previous incidents
 - iv. Tabletop exercises and scenarios
- c. All training in line with standard operating procedures and national, state and regional standards, rules, regulations and “best practices”
- d. Periodic joint training sessions with other emergency responders (PD, EMS, DOT etc.)
- e. Resources:
 - i. Emergency Responder Safety Institute - www.respondersafety.com
 - ii. Responder Safety Learning Network – <http://learning.respondersafety.com>
 - iii. FHWA On-scene Traffic Incident Management Operations
http://ops.fhwa.dot.gov/eto_tim_pse/about/onscene.htm
 - iv. I-95 Corridor Coalition Quick Clearance Toolbox
<http://i95coalition.org/projects/quick-clearance/>

- 3) Multi-agency & multi-jurisdictional cooperation, collaboration & communication;**
- a. All responding agencies attend and participate regularly in local and/or regional Traffic Incident Management Committees (TIM Committees).
 - b. Multi-agency planning and training on roadway incident response procedures on an ongoing basis
 - c. Multi-agency review and critique of traffic incidents with the goal of improving strategies and tactics at future incidents
 - d. Resources:
 - i. USFA & DOT Traffic Incident Management Systems
https://www.usfa.fema.gov/downloads/pdf/publications/fa_330.pdf
 - ii. <http://www.respondersafety.com/Training/Downloads.aspx>
- 4) Proper positioning of emergency vehicles & traffic control equipment at incidents**
- a. Large fire apparatus parked at an angle upstream of the incident work area
 - b. Front wheels turned away from incident scene and units properly chocked when parked
 - c. Proper deployment of advance warning devices
 - i. Flares - <http://www.ncjrs.gov/App/Publications/abstract.aspx?ID=246237>
 - ii. MUTCD compliant high-visibility signs
 - iii. DOT cones – orange with reflective stripes (Not lime-green!)
 - iv. Variable message signs
 - d. Ambulances positioned downstream with the loading area doors angled away from moving traffic whenever possible
 - e. All emergency equipment parked on one side of the road
 - f. Effective placement of police cars for advance warning, traffic control and scene safety
 - g. Effective use of any available safety service patrol apparatus
 - h. Resources:
 - i. SOP/SOG Template For Your Fire Department
“Safe Positioning While Operating or Near Moving Traffic” -
http://www.respondersafety.com/DownloadCategories/SOPs_SOGs.aspx
- 5) Proper PPE for all personnel**
- a. OSHA compliant PPE Hazard Assessment documented (<https://goo.gl/NSKPnr>)
 - b. NFPA compliant personal protective equipment (NFPA 1500, 1901, 1971)
 - c. ANSI 107 compliant high-visibility garments
 - d. Resources:
 - i. Personal Protective Equipment, OSHA requirements:
<https://www.osha.gov/SLTC/personalprotectiveequipment/standards.html>
 - ii. NFPA 1971 (2018): Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting
<http://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1971>
 - iii. ANSI 107 (2015) Standard - <https://safetyequipment.org/ansiisea-107-2015/>

6) Enhanced visibility & traffic control design features for emergency vehicles

- a. Emergency warning lights designed for on-scene protection for fire apparatus
 - i. Effective lighting when unit parked at an angle
 1. Mounted high with 360 degree capability
 2. Side-mounted traffic direction lights (arrow devices)
 3. Arrow boards or variable message boards
 - ii. NFPA 1901 (2016) compliant high-visibility (reflective and florescent) chevrons on the rear of fire apparatus, road cones and PPE
- b. Emergency warning lights and high-visibility markings for ambulances
 - i. High-visibility markings for the inside of ambulance compartment doors
 - ii. NFPA 1917 (2019) compliant emergency lighting and high-visibility (reflective and florescent) chevrons on the rear of new ambulances
- c. Resources:
 - i. NFPA 1901: Standard for Automotive Fire Apparatus - <https://goo.gl/bcd51F>
 - ii. NFPA 1917: Standard for Automotive Ambulances - <https://goo.gl/vjC8Gy>
 - iii. USFA Emergency Vehicle Visibility and Conspicuity Study - http://www.usfa.fema.gov/downloads/pdf/publications/fa_323.pdf
 - iv. USFA Study of Emergency Vehicle Warning Lighting <http://www.usfa.fema.gov/downloads/pdf/sae0905.pdf>
 - v. Study of Protecting Emergency Responders on the Highways and Operation of Emergency Vehicles - <https://tinyurl.com/s7x5hch>

7) Connected, Autonomous and Semi-Autonomous Vehicle Information

- a. Waymo Autonomous Vehicle Safety Report - <https://waymo.com/safety/>
- b. Ford Autonomous Vehicle Safety Report <https://media.ford.com/content/fordmedia/fna/us/en/news/2018/08/16/a-matter-of-trust-ford-releases-safety-assessment-report.html>
- c. GM Autonomous Vehicle Safety Reports <https://www.gm.com/our-stories/self-driving-cars.html>
- d. Dwiggins, Sullivan & LaSala, "Autonomous Vehicles: What a Fire Chief Needs to Know." International Association of Fire Chiefs, 7 Dec. 2018: <https://www.iafc.org/on-scene/on-scene-article/autonomous-vehicles-what-a-fire-chief-needs-to-know>
- e. Connected Vehicle Basics. Intelligent Transportation Systems Joint Program Office. Office of the Assistant Secretary for Research and Technology. United States Department of Transportation - https://www.its.dot.gov/cv_basics/cv_basics_what.htm
- f. Werner, Charles. Fire Service Technology: The Future of Connected Vehicle Technology. Firehouse. 1 Feb 2017. <https://www.firehouse.com/home/article/12286919/fire-service-technology-the-future-of-connected-vehicle-technology>

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Traffic Incident Management & Responder Safety

Emergency responses to traffic incidents are rising and the main challenge is about how to safely manage those incidents in the best way to protect not only the emergency responders but also the victims of the initial incident and the motorists who are trying to pass by the scene. The secondary challenge is how to quickly clear the scene and resume normal traffic flow.

Statistics

In 2005 the Bureau of Labor Statistics (BLS) reported 390 workers of all occupations were struck and killed by vehicles on roadways. That number was up from the 378 fatalities reported in 2004. The BLS reports that there were 268 struck-by-vehicle incidents in 2009 and 277 similar incidents in 2010 and that struck-by vehicle incidents accounted for 6% of all fatal occupational injuries in 2009-2010. (Source - <http://www.bls.gov/news.release/cfoi.toc.htm>)

A 2001 NIOSH report indicated 26 firefighters struck and killed between 1990 and 1999 which at that time represented an 89% increase in those types of fatalities from 1995 to 2000. An NFPA report indicated that 36 firefighters were struck and killed by vehicles from 1989 to 1998. (Source: <http://www.cdc.gov/niosh/docs/2001-143/>). The NFPA annual Firefighter Fatality Reports also indicate that there were 3 firefighters struck and killed by vehicles in 2005; 3 similar firefighter fatalities in 2006; 1 firefighter fatality in 2007; 4 firefighter fatalities in 2008; and 4 firefighters killed in 2009 when struck by vehicles. There is no unified formal process in place at the moment to track the total number of struck-by-vehicle incidents involving emergency responder injuries, close calls and/or property damage.

The Emergency Responder Safety Institute tracked the following “struck-by-vehicle” fatal incidents involving firefighters and/or emergency medical personnel, both on and off duty for the last 10 years:

Firefighter & EMS Provider Struck-by-Vehicle Fatalities			
YEAR	LODDs	# Off-Duty	Totals
2008	6		6
2009	3		3
2010	5		5
2011	2		2
2012	4		4
2013	4		4
2014	2		2
2015	7	2	9
2016	4		4
2017	12	3	15
2018	5	1	6
2019	7	2	9
TOTALS	61	8	69

There are dozens of struck by vehicle incidents each year with injuries (including serious disabling injuries like amputations) and property damage. ERSI tracks an **average of 60 incidents per year** where firefighters, EMS personnel and/or their vehicles are struck and injured or damaged by other vehicles.

Roadway Incident Safety References and Resources

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NIOSH Firefighter Fatality Investigations and Prevention Program Investigations Involving "Struck By Vehicle" Incidents:

<http://www.cdc.gov/niosh/fire/>

or

[https://wwwn.cdc.gov/NIOSH-fire-fighter-](https://wwwn.cdc.gov/NIOSH-fire-fighter-face/Default.cshtml?state=ALL&Incident_Year=ALL&Medical_Related=ALL&Trauma_Related=0021&Submit=Submit)

[face/Default.cshtml?state=ALL&Incident_Year=ALL&Medical_Related=ALL&Trauma_Related=0021&Submit=Submit](https://wwwn.cdc.gov/NIOSH-fire-fighter-face/Default.cshtml?state=ALL&Incident_Year=ALL&Medical_Related=ALL&Trauma_Related=0021&Submit=Submit)

NIOSH Report 99F-27 - August 5, 1999 Incident in Oklahoma
2 Career firefighters were struck on an interstate; one was killed.

Available on the internet: <http://www.cdc.gov/niosh/fire/reports/face9927.html>

NIOSH Report 99F-38 - September 27, 1999 Incident in South Carolina
Firefighter dies after being struck by a tractor trailer truck.

Available on the internet: <http://www.cdc.gov/niosh/fire/reports/face9938.html>

NIOSH Report F2003-37 - Oct 27, 2003 Incident in Minnesota
Assistant chief is struck and killed at road construction site

Available on the internet: <http://www.cdc.gov/niosh/fire/reports/face200337.html>

NIOSH Report F2003-16 - Feb 23, 2003 Incident in New Jersey
Fire police captain dies from injury-related complications after being struck by motor vehicle

Available on the internet: <http://www.cdc.gov/niosh/fire/reports/face200316.html>

NIOSH Report F2003-13 - Mar 18, 2003 Incident in Texas
Firefighter killed while walking across an Interstate highway

Available on the internet: <http://www.cdc.gov/niosh/fire/reports/face200313.html>

NIOSH Report F2002-38 - Jul 01, 2002 Incident in Minnesota
Fire captain killed, two fire fighters and police officer injured when struck by a motor vehicle

Available on the internet: <http://www.cdc.gov/niosh/fire/reports/face200238.html>

NIOSH Report F2002-35 - Jun 08, 2002 Incident in Florida
Off-duty career fire fighter dies and another fire fighter is injured after being struck by a truck

Available on the internet: <http://www.cdc.gov/niosh/fire/reports/face200235.html>

NIOSH Report F2002-18 - Apr 11, 2002 Incident in Kansas
Fire chief dies after being struck by a fire truck at a motor-vehicle incident

Available on the internet: <http://www.cdc.gov/niosh/fire/reports/face200218.html>

NIOSH Report F2007-26 – July 27, 2007 Incident in Illinois
Fire Fighter Dies When Struck By a Bus While Working Along an Interstate Highway

Available on the internet: <http://www.cdc.gov/niosh/fire/reports/face200726.html>

NIOSH Report F2010-06 - Feb 12, 2010 Incident in Pennsylvania
Fire Police Captain Dies After Being Struck by a Motor Vehicle at a Controlled Roadway

Available on the internet: <http://www.cdc.gov/niosh/fire/reports/face201006.html>

NIOSH Report F2010-36 – November 13, 2010 Incident in South Carolina
Fire Fighter Killed, Another Seriously Injured When Struck By a Vehicle at Grass Fire Along Interstate
Available on the internet: <http://www.cdc.gov/niosh/fire/reports/face201036.html>

NIOSH Report F2011-23 – September 18, 2011 Incident in Iowa
Fire Fighter Struck and Killed While Directing Traffic at an Interstate Highway Incident
Available on the internet: <http://www.cdc.gov/niosh/fire/reports/face201123.html>

NIOSH Report F2016-16 - February 29, 2012 Incident in California
Fire Captain Dies When Struck by a Pickup Truck Working at the Scene of Two Traffic Incidents
Available on the internet: <https://www.cdc.gov/niosh/fire/reports/face201207.html>

NIOSH Report F2012-09 - March 19, 2012 Incident in Arkansas
Fire Captain killed, fire fighter & police officer injured at the scene of a motor vehicle crash
Available on the internet: <https://www.cdc.gov/niosh/fire/reports/face201209.html>

NIOSH Report F2013-05 - March 5, 2013 Incident in Illinois
Fire Fighter Killed When Struck While Operating at Scene of Vehicle Crash on Interstate Highway
Available on the internet: <https://www.cdc.gov/niosh/fire/reports/face201305.html>

NIOSH Report F2013-06 - March 28, 2013 Incident in New Jersey
Forest Fire Service Fire Fighter Monitoring Prescribed Burn from Roadway is Struck and Killed When
Smoke Obscures Visibility Following a Wind Shift
Available on the internet: <https://www.cdc.gov/niosh/fire/reports/face201306.html>

NIOSH Report F2013-12 - April 27, 2013 Incident in Pennsylvania
Fire Chief Struck and Killed on Interstate Highway While Directing Traffic
Available on the internet: <https://www.cdc.gov/niosh/fire/reports/face201312.html>

NIOSH Report F2014-06 – February 10, 2014 Incident in Texas
Fire Fighter Struck & Killed While Working a Crash Scene on Ice Covered Interstate Overpass
Available on the internet: <https://www.cdc.gov/niosh/fire/reports/face201406.html>

NIOSH Report F2016-16 – July 23, 2016 Incident in Pennsylvania
Fire Fighter Struck and Killed by Tanker Backing into the Bay of the Fire Station
Available on the internet: <https://www.cdc.gov/niosh/fire/reports/face201616.html>

NIOSH Report F2017-10 - August 08, 2018 Incident in Mississippi
Two Fire Fighters Die and One Fire Fighter Injured When Struck at a Roadway Incident
Available on the internet: <https://www.cdc.gov/niosh/fire/reports/face201710.html>