# FIREFIGHTER FATALITY INVESTIGATIONS

## Annual Report
## FY 2016

September 2016

TEXAS DEPARTMENT OF INSURANCE

**Texas Department of Insurance**
**David Mattax,** Commissioner of Insurance
**Chris Connealy,** State Fire Marshal

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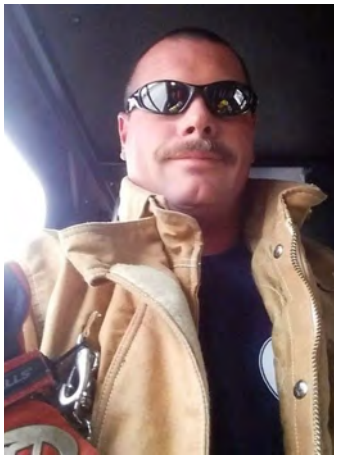
# Executive Summary

During the State of Texas Fiscal Year 2016 (September 1, 2015, to August 31, 2016), the State Fire Marshal's Office (SFMO) conducted seven firefighter fatality incident investigations. The seven investigations involved a total of seven fatalities.



**Firefighter Daniel Hampton**
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# Texas Firefighter Fatality Investigation Authority

In 2011, the 82nd Legislature enacted SB 396, requiring the SFMO to investigate firefighter fatalities occurring "in the line of duty or in connection with an on-duty incident." This bill expands the investigative jurisdiction of the SFMO, which had previously investigated only those fatalities occurring in connection with a firefighting incident. This change took effect May 12, 2011.

The statute requires the SFMO to investigate the circumstances surrounding the death of the firefighter, including factors that may have contributed to the death of the firefighter. The term "firefighter" includes an individual who performs fire suppression duties for a governmental entity or volunteer fire department.

The State Fire Marshal is required to coordinate the investigative efforts of local government officials and may enlist established fire service organizations and private entities to assist in the investigation. The State Fire Marshal has appointed an Investigation Panel to provide Firefighter Fatality Investigation Program policy guidance. The following entities serve on the Firefighter Fatality Investigation Panel:

- State Firefighters' and Fire Marshals' Association of Texas
- Texas A&M Engineering Extension Service
- Texas A&M Forest Service
- Texas Chapter of the International Association of Arson Investigators (IAAI)
- Texas Commission on Fire Protection
- Texas Fire Chiefs Association

- Texas Fire Marshals' Association
- Texas State Association of Fire Fighters
- Texas metropolitan fire departments (including Austin, Dallas, El Paso, Fort Worth, Houston, and San Antonio)

The Texas Commission on Fire Protection (TCFP) is charged with developing and establishing criteria to receive and analyze injury information pertaining to Texas firefighters, and to transmit its report to the State Fire Marshal for inclusion in this annual report, through §419.048 of Senate Bill 1011, passed during the 81st Legislature.

The Texas Commission on Fire Protection Injury Report for calendar year 2015 is included as an appendix to this report.

# Fiscal Year 2016 Investigation Summary

## Firefighter Daniel Hampton

**Burnet Fire Department**

**September 18, 2015**

Traffic accident while on duty

On September 18, 2015, Burnet Fire Department (BFD) Firefighter/EMT (FF) Daniel Hampton and Firefighter/Paramedic Timothy Pierce were transporting a patient from Seton Highland Lakes Hospital in Burnet to Seton Medical Center Williamson in Georgetown, Texas, via ambulance non-emergent (Basic Life Support). FF Hampton was driving BFD Medic 10. During transport the ambulance rear-ended a semi-tractor trailer that was stopped to make a left turn. FF Hampton died at the scene. FF Pierce and the patient were both in critical condition and transported to area hospitals.

The autopsy revealed the cause of death to be "Blunt Trauma" with the manner of death as "Accident."

## Captain Larry O'Neil

**Lone Camp Volunteer Fire Department**

**October 25, 2015**

Cardiac arrest while on the scene of a medical call

On October 25, 2015, Lone Camp Volunteer Fire Department (LCVFD) Firefighter Larry O'Neil responded to a medical call at the Lone Camp Baptist Church. FF O'Neil was driving

LCVFD 761. When he arrived at the scene, FF O'Neil did not exit the vehicle. Firefighter/ EMT-I Jimmy Coke arrived and found FF O'Neil unresponsive and in cardiac arrest. Advance Life Support (ALS) and Cardio Pulmonary Resuscitation (CPR) were initiated and FF O'Neil was transported by Santo EMS to Palo Pinto General Hospital where he was later pronounced dead.

An autopsy was conducted at Southwestern Institute of Forensic Sciences at Dallas. Pathologist Jeffery Barnard determined the cause of death to be:

a) Hemopericardium with cardiac tamponade
b) Rupture of aortic dissection
c) Hypertensive cardiovascular disease
d) Contributing factors: Diabetes mellitus, obesity

The manner of the death was ruled as "Natural."

## Firefighter Richard Cano

**Cy-Fair Volunteer Fire Department**
**November 29, 2015**
Cardiac event after coming off duty

On November 22, 2015, Firefighter Richard Cano returned home from his shift and went to sleep on the couch. At approximately 8:40 AM, FF Cano's wife witnessed what appeared to be seizure-like activity and called 911. Arriving units found his wife performing Cardio Pulmonary Resuscitation (CPR) and they began Advance Life Support (ALS) care. FF Cano was transported to North Cypress Medical Center. FF Cano was stabilized and moved to the Intensive Care Unit. On November 29, 2015, FF Cano passed away at North Cypress Medical Center.

An autopsy was conducted and cited the cause of death as atherosclerotic and hypertensive cardiovascular disease.

## Firefighter Stacy Crawford

**Navarro County ESD #1**

**December 19, 2015**

Cardiac event during training

On December 19, 2015, Firefighter Stacy Crawford was at Navarro County Emergency Services District #1 (NCESD #1) in Powell, Texas, for in-service training on a new fire apparatus. FF Crawford was new to the department and was being issued Personal Protective Equipment (PPE). While trying on bunker pants FF Crawford collapsed and appeared to have a seizure. Fire Chief Kuta witnessed the incident and alerted other staff members. FF Crawford was found to have no pulse and was not breathing. Cardio Pulmonary Resuscitation (CPR) was initiated and an ambulance requested. Advance Life Support (ALS) was initiated. FF Crawford was transported to Navarro Regional Hospital where he later succumbed to his illness.

American Forensics conducted an autopsy, which cited the cause of death as cardiac tamponade due to coronary artery dissection and rupture.

## Driver Engineer Marco Davila

**Dallas Fire-Rescue**

**March 23, 2016**

Cardiac event after coming off duty

On March 23, 2016, Dallas Fire-Rescue Department (DFR) Driver Engineer (DE) Marco Davila was working out at Gold's Fitness Gym, 2425 McKinney Avenue, Dallas, Texas, and began experiencing chest pain. After a call to 911, DFR was dispatched. Rescue Unit 18 discovered the patient was DFR member Marco Davila. Davila was diaphoretic, short of breath, weak, and distressed. Rescue Unit 18 transported Davila to Baylor University Medical Center and transferred care. Davila later succumbed to his illness and was pronounced dead at 9:47 PM. This event occurred less than 24 hours after Davila's last response to an automobile fire as the Driver Engineer for Engine 15.

An autopsy was conducted on DE Davila by Dr. Stephen Hastings, MD, with the Southwestern Institute of Forensic Sciences, Dallas, Texas. The autopsy concluded the cause of death was hypertensive and atherosclerotic cardiovascular disease.

## Cadet Steven Whitfield II

**Houston Fire Department**

**March 31, 2016**

Medical event during training

On March 31, 2016, at approximately 11:07 AM, Houston Fire Department (HFD) Cadet Steven Whitfield II was completing the course in the Survival House at the Val Jahnke Training Facility. The facility is used for training new HFD cadets and providing continuing education for HFD and other departments. Cadet Whitfield was in full Personal Protective Equipment (PPE) including a Self-Contained Breathing Apparatus (SCBA) and face-piece. Cadet Whitfield had completed the majority of the course and was between stations six and seven when he collapsed. Cadet Whitfield's Personal Alert Safety System (PASS) device went into alert. Instructors and fellow cadets extricated Cadet Whitfield. Cadet Whitfield was found not breathing and pulseless with an elevated temperature. Advanced Life Support (ALS), including Cardio Pulmonary Resuscitation (CPR) and active cooling measures were initiated. HFD Medic 44 (M44) was nearby and assumed patient care. Cadet Whitfield's initial temperature was 108°. M44 transported Cadet Whitfield to Memorial Hermann City Medical Center and transferred care to the Emergency Department staff. Cadet Whitfield never regained a pulse and succumbed to his illness. He was pronounced dead at 12:48 PM.

Jennifer Ross, M.D., with the Harris County Institute of Forensic Sciences conducted an autopsy and determined the cause of death was hyperthermia and dehydration. The exact cause of the hyperthermia is not determined. The use of dietary and performance enhancing supplements, as well as the recently discontinued course of prednisone and meloxicam for a pulled muscle, could not be ruled out as contributing factors.

## Firefighter Kendall Reynolds

**Buffalo Volunteer Fire Department**

**July 3, 2016**

Medical event while on duty

Firefighter Reynolds responded to two medical helicopter assist calls and during both calls complained of feeling ill. FF Reynolds was later admitted to East Texas Medical Center,

Tyler, Texas, and diagnosed with a CVA (Stroke). FF Reynolds died on July 3, 2016, while at East Texas Medical Center.

This incident is still under investigation.

# Strategies for Preventing Firefighter Fatalities

The State Fire Marshal's Office encourages utilization of strategies developed by the State Fire Marshal's Office and nationally recognized organizations in the effort to reduce firefighter fatalities:

- The State Fire Marshal's Office communicates the "lessons learned" from firefighter fatality investigations through the publication of investigation reports, dissemination of information to the Firefighter Fatality Investigation Panel, and presentations at fire service conferences.

- Firefighter fatality investigation reports are sent to the affected fire departments and then placed on the State Fire Marshal's Office website (http://www.tdi.texas.gov/fire/fmloddinvesti.html) for access by the fire service, media, and the public.

- United States Fire Administration (http://www.usfa.fema.gov) statistics indicate that heart attacks are the chief cause of firefighter deaths. The National Volunteer Fire Council provides information on how to be heart healthy (http://www.healthy-firefighter.org).

- Participate in the "Firefighter Safety Stand Down," sponsored by the International Association of Fire Chiefs (www.iafc.org) and the International Association of Fire Fighters (www.iaff.org).

- Participate in the "Courage to be Safe" (CTBS) program that emphasizes the message "Everyone Goes Home." Information on the CTBS program is available online at http://www.everyonegoeshome.com. (See The 16 Firefighter Life Safety Initiatives below.)

- Implement or expand existing fire prevention programs to assist in reducing the number of fires.

- Participate in the National Fire Service Seat Belt Pledge (www.firehero.org) by the National Fallen Firefighters Foundation, which encourages firefighters to wear seat belts when riding in a fire department vehicle.

- Explore safer strategies and tactics for fighting fires in enclosed structures by publishing findings and recommendations revealed during firefighter fatality investigations.

- Provide information to the fire service and the public on the effectiveness of residential sprinklers in reducing civilian and firefighter fatalities as well as property loss caused by fire.

- Pre-fire incident planning by suppression personnel for high-risk occupancies in their response area. The pre-fire planning should include consideration of life safety for firefighters and occupants, water supply, and structural hazards.

- Include fire prevention and firefighter fatality prevention in all firefighter training and education, including initial training in firefighter academies across the state, as a top priority.

- Emphasize the need for firefighter training on how modern construction technologies such as lightweight structural materials and green building practices can change building performance and fire behavior, and how these new technologies impact firefighter safety and fireground operations (http://www.greenbuildingfiresafety.org/).

**Everyone Goes Home: The 16 Firefighter Life Safety Initiatives**

The 16 Firefighter Life Safety Initiatives were jointly developed by representatives of the major fire service constituencies in 2004 at a Firefighter Safety Summit in Tampa, FL.

At that time, the National Fallen Firefighters Foundation was tasked with promulgating the Initiatives throughout the fire service, and developing material to support their implementation.

Since then, the Initiatives have deeply informed the emerging safety culture in the U.S. fire service, and become the bedrock foundation for thousands of fire departments and EMS organizations who have a desire to ensure that their firefighters and medics return home safely after every shift.

1. Cultural Change
Define and advocate the need for a cultural change within the fire service relating to safety; incorporating leadership, management, supervision, accountability and personal responsibility. (See Appendix 1: *Changing the Culture of Safety in the Fire Service*, by Ronald J. Siarnicki and Richard Gist.) *U.S. Fire Administration National Safety Culture Change Initiative FA-342/April 2015*

2. Accountability
Enhance the personal and organizational accountability for health and safety throughout the fire service.

3. Risk Management
Focus greater attention on the integration of risk management with incident management at all levels, including strategic, tactical and planning responsibilities.

4. Empowerment
All firefighters must be empowered to stop unsafe practices.

5. Training & Certification
Develop and implement national standards for training, qualifications, and certification (including regular recertification) that are equally applicable to all

firefighters based on the duties they are expected to perform.

6. Medical & Physical Fitness
Develop and implement national medical and physical fitness standards that are equally applicable to all firefighters, based on the duties they are expected to perform.

7. Research Agenda
Create a national research agenda and data collection system that relates to the 16 Firefighter Life Safety Initiatives.

8. Technology
Utilize available technology wherever it can produce higher levels of health and safety.

9. Fatality, Near-Miss Investigation
Thoroughly investigate all firefighter fatalities, injuries, and near-misses.

10. Grant Support
Grant programs should support the implementation of safe practices and procedures and/or mandate safe practices as an eligibility requirement.

11. Response Policies
National standards for emergency response policies and procedures should be developed and championed.

12. Violent Incident Response
National protocols for response to violent incidents should be developed and championed.

13. Psychological Support
Firefighters and their families must have access to counseling and psychological support.

14. Public Education

Public education must receive more resources and be championed as a critical fire and life safety program.

15. Code Enforcement & Sprinklers

Advocacy must be strengthened for the enforcement of codes and the installation of home fire sprinklers.

16. Apparatus Design & Safety

Safety must be a primary consideration in the design of apparatus and equipment.

# Firefighter Safety Recommendations

The following are some recommendations from past reports of investigations conducted by the State Fire Marshal's Office.

1. Define and advocate the need for a cultural change within the fire service relating to safety; incorporating leadership, management, supervision, accountability and personal responsibility. *U.S. Fire Administration National Safety Culture Change Initiative FA-342/April 2015*

2. Fire departments should establish standard operating procedures (SOPs) for minimum requirements of a fire service related occupational safety and health program in accordance with the ***National Fire Protection Association (NFPA) Standard 1500,*** *Standard on Fire Department Occupational Safety and Health Program,* 2007 Edition**.**

3. Provide mandatory pre-placement and annual medical evaluations to all firefighters consistent with ***NFPA 1582,*** *Standard on Comprehensive Occupational Medical Program for Fire Departments,* 2007 Edition, to determine their medical ability to perform duties without presenting a significant risk to the safety and health of themselves or others.

4. Perform an annual physical performance (physical ability) evaluation to ensure firefighters are physically capable of performing the essential job tasks of fire fighting. ***NFPA 1583,*** *Standard on Health Related Fitness Programs for Firefighters,* 2008 Edition.

5. Ensure that firefighters are cleared for duty by a physician knowledgeable about the physical demands of firefighting, the personal protective equipment used by firefighters, and the various components of ***NFPA 1592,*** *Standard on Comprehensive Occupational Medicine Program for Fire Departments.*

6. No risk to the safety of personnel shall be acceptable where there is no possibility to save lives or property. ***NFPA 1561,*** Chapter 5, Section 5.3.19; ***Texas Commission on Fire Protection Standards Manual,*** Chapter 435, Section 435.15, Part b, Paragraphs 1 and 2.

7. Always attack a wildland fire from the burned area. If this is done and a sudden change in conditions or wind occurs, the unit can retreat farther into the black where fuel has previously been consumed. **Texas Forest Service,** *"Attack from the Black"* training DVD, "The black is the best safety zone" http://txforestservice.tamu.edu/main/popup.aspx?id=9514

   The *Fireline Handbook* has been retired and replaced with an electronic file, a pdf, called *Wildland Fire Incident Management Field Guide* (PMS 210) April 2013. A memo released by the National Wildfire Coordinating Group (NWCG) suggests that the new 148-page document "can be printed locally in a standard 8½" x 11," three-ring binder format."

   When it was first introduced, the *Fireline Handbook*, PMS 410-1, was appropriately named, fitting easily in your hand and pocket. Over several decades it became bloated, as committees kept adding everything they could think of to it until it was over an inch thick and weighed almost a pound (15 ounces). It grew to 430 pages without the optional Fire Behavior Appendix and barely fit into your pants pocket. It was last updated in 2004.

   The *Fireline Handbook* has become less valuable as other reference guides have been introduced, including the *Incident Response Pocket Guide* (IRPG) and the *Interagency Standards for Fire and Fire Aviation Operations*, better known as the Red Book. The newer guides had some of the same information as the *Fireline Handbook*. The *Wildland Fire Incident Management Field Guide* still has some information that is

duplicated in the *Incident Response Pocket Guide* (IRPG) and FEMA's *National Incident Management System Emergency Responder Field Operating Guide* (ERFOG), but according to the NWCG, which published the new guide, the documents have different purposes and user groups.

*Wildfire Today* first wrote about the possible demise of the *Fireline Handbook in* March 2011.

8. Egress routes and safety zones should be well identified and communicated to everyone on the scene before fire operations begin. Staging areas should be set up to not interfere with ingress or egress, to afford safety to the firefighters using the areas. ***NFPA 1143,*** Annex Section 5.4.2
***Texas Commission on Fire Protection Standards Manual,*** Chapter 435, Section 435.15, Part a
***IFSTA (2013),*** *Essentials of Fire Fighting*, (6th Edition), Chapter 6, page 315, Fire Protection Publications, Oklahoma State University
**National Wildfire Coordinating Group,** *Wildland Fire Incident Management Field Guide* (PMS 210) April 2013, Chapter 1, Firefighter Safety

9. All firefighters on the scene of a fire and actively engaged in firefighting operations should be in approved full personal protective equipment (PPE) suitable for the type of fire incident. **National Wildfire Coordinating Group,** *Wildland Fire Incident Management Field Guide* (PMS 210) April 2013, Chapter 1, Firefighter Safety
***IFSTA (2013),*** *Essentials of Fire Fighting,* (6th Edition), Chapter 6, Fire Protection Publications, Oklahoma State University

10. Fire departments must use a system of accountability whereby the incident commander can easily and immediately be able to determine not only that a firefighter is on the fireground but also his location and task assignment at any given time. ***Texas Commission on Fire Protection Standards Manual,*** Chapter 435, Section 435.13, Part b, Paragraphs 3 and 4; and Part d

11. Instruct firefighters and command staff that hydration alone will not prevent heat-related illness (HRI). ***NIOSH*** *Report F2011-17,* April 2012.

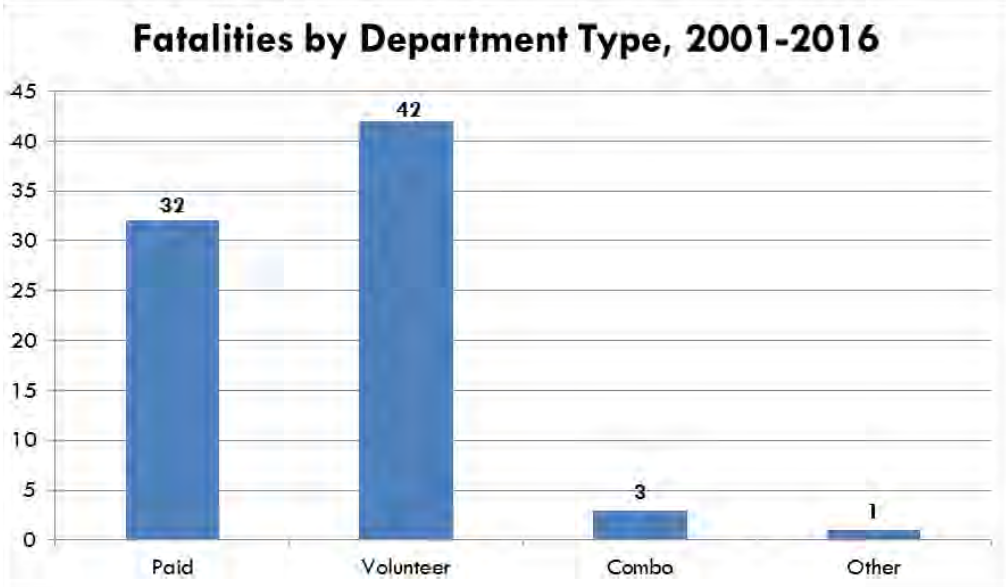
***NFPA 1561,*** 5.3.7.1 "Following the initial stages of the incident, the incident commander shall establish a stationary command post."
*Fire Command*, (2nd Edition), Chapter 1, "The Command Post," Alan V. Brunacini, Von Hoffman Corp.
***IFSTA (2013),*** *Essentials of Fire Fighting*, (5th Edition), Chapter 1, page 39, Fire Protection Publications, Oklahoma State University

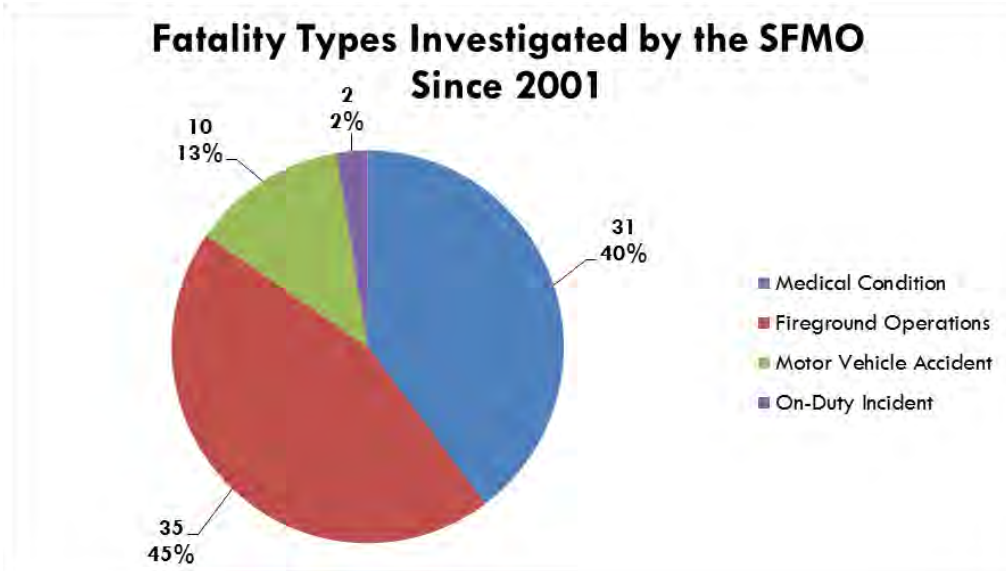
13. The use of all PPE including SCBA is mandatory when operating in areas where members are exposed or potentially exposed to the hazards for which PPE is provided.
***NFPA 1500,*** Chapter 7, Protective Clothing
***IFSTA (2013),*** *Essentials of Fire Fighting,* (6th Edition), Chapter 5
***Texas Commission on Fire Protection Standards Manual,*** Chapter 435, Fire Fighter Safety

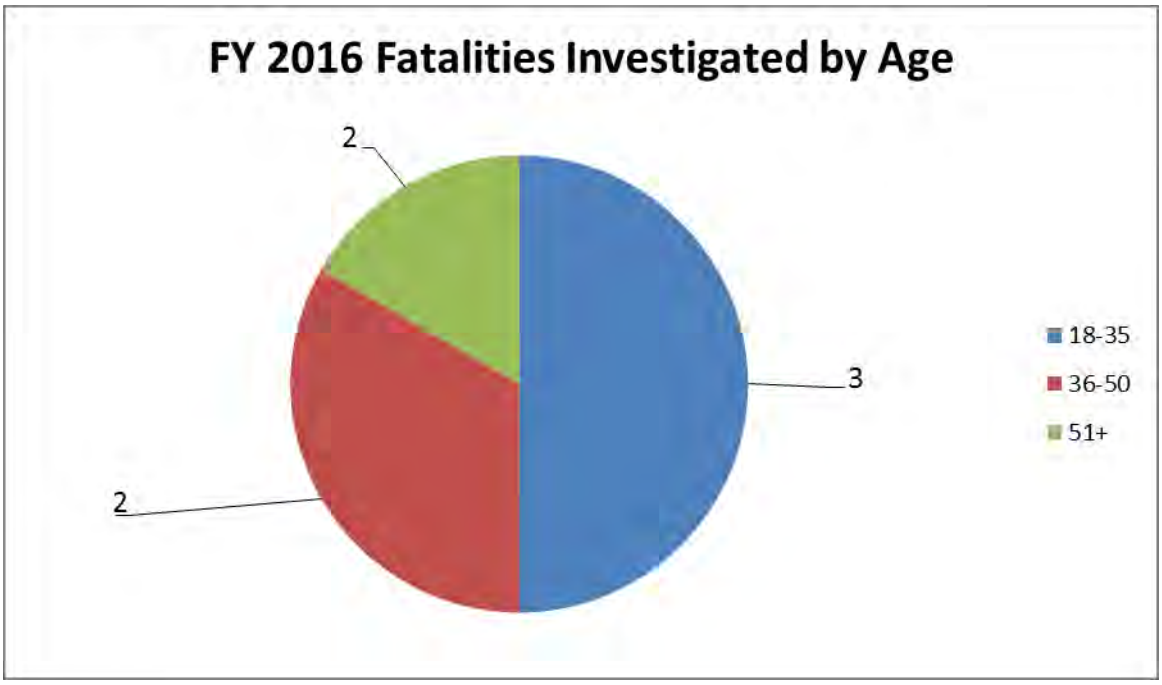
14. Use tools and tactics that help reduce the dangers of roof operations. Become familiar with those indicators that are a precursor to collapse.
***IFSTA (2013),*** *Essentials of Fire Fighting,* (6th Edition), Chapter 11, pp. 476 and 556-560
***IFSTA (1994),*** *Fire Service Ventilation,* (7th Edition), pp. 86-89, Fire Protection Publications, Oklahoma State University

15. Consider monitoring and recording fireground activity. ***NFPA 1221,*** Chapter 7, Sec. 7.6, Recording

# Statistics and Comparisons of Firefighter Fatalities




FY 2016 Fatalities Investigated by Age
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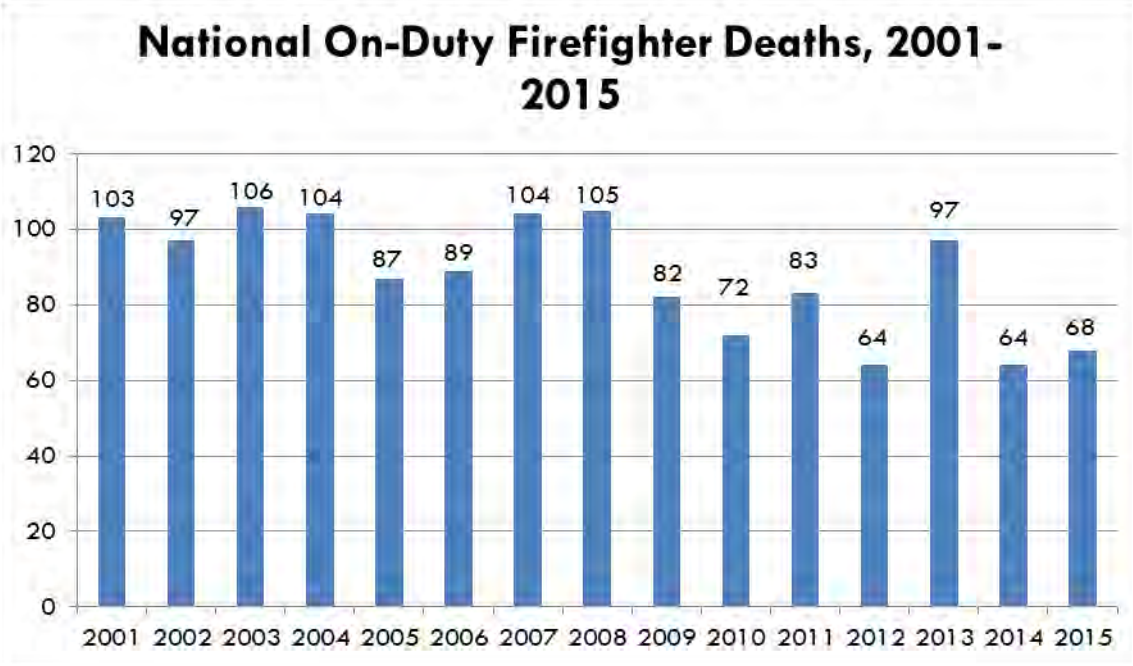
National On-Duty Firefighter Deaths, 2001-2015
120
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U.S. Fire Administration

# National Safety Culture Change Initiative

FA-342/April 2015

FEMA

# U.S. Fire Administration

## Mission Statement

*We provide national leadership to foster a solid foundation for our fire and emergency services stakeholders in prevention, preparedness, and response.*

FEMA

# National Safety Culture Change Initiative

## Study of Behavioral Motivation on Reduction of Risk-Taking Behaviors in the Fire and Emergency Service

Developed by the
International Association of Fire Chiefs
through a partnership with the
U.S. Fire Administration

April 2015

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## *Project Team*

### Working Group

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International Association of Fire Chiefs (IAFC) Safety, Health and Survival (SHS) Section — I. David Daniels

International Association of Fire Fighters (IAFF) — Patrick Morrison

National Fallen Firefighters Foundation (NFFF) — Victor Stagnaro

National Fire Protection Association (NFPA) — John Caufield

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## Executive Summary

Controlling and extinguishing hostile fire comes at a great cost to human life and secondarily at great financial expense. Despite improvements in personal protective equipment (PPE), apparatus safety devices, more availability of training, greater emphasis on firefighter health and wellness, and decreases in the number of fires and dollar loss due to fires, the rate of on-duty firefighter death and injury has remained relatively unchanged in the past four decades. The National Safety Culture Change Initiative (NSCCI) project is a joint partnership of the U.S. Fire Administration (USFA) and the International Association of Fire Chiefs (IAFC) aimed at identifying both positive and negative culture and climate found in the American fire and emergency service community. NSCCI, through this study and its website, www.ffsafetyculture.org, and other project efforts, will identify adverse behaviors and recommend changes to both culture and climate for occupational safety and health within the fire and emergency service.

## Contributors

The organizations and individuals who contributed to this paper were selected as a representative cross section of the fire service. The intent was to capture both the breadth of the fire service, encompassing the different delivery models of emergency response, and the depth of the fire service by including groups that had agendas to look at the specific needs of the fire service. Additionally, the individual experiences of those connected to the creation of this paper, both within and outside of the fire service, provided a rich backdrop for discussion and comment of diverse viewpoints throughout the development of the paper.

## Introduction

The National Fallen Firefighters Foundation (NFFF) has asserted that the culture of the fire and emergency service is a major contributor to the fatal trend in firefighter health and safety (Siarnicki, 2010). This culture has not been concisely defined, but literature suggests both that it exists as a stand-alone concept and that it has unique characteristics that are uncommon to nonuniformed professions. Soeters, a leading scholar in the organizational culture of military and emergency service units, states that the peculiarities of organizations, such as the fire and Emergency Service, "justify the special attention of researchers to the culture and identity of these ... organizations" (Soeters, 2000, p. 466). An understanding of the culture can be used to develop safer practices to reduce the number of firefighters killed and injured each year.

This effort is directly related to three of NFFF's 16 Firefighter Life Safety Initiatives (FLSIs). FLSI 1, which states: **Define and advocate the need for a cultural change within the fire service relating to safety; incorporating leadership, management, supervision, accountability, and personal responsibility** (NFFF, 2011), is an overarching initiative, acknowledging that the organizational culture of the fire service must undergo a change to accept the other 15 recommendations. Without understanding the culture within a fire and emergency service organization, it is likely that changes called for in the other 15 initiatives cannot be successfully implemented or sustained. Initiatives 2 and 6 are also very relevant to this project. Since 50 percent of line-of-duty deaths (LODDs) are attributed to cardiovascular events and one-third of these deaths are in people with known cardiac histories, health and safety of agency members is a controllable risk factor (NFFF, 2011, p. 13). Initiative 6 encourages implementation of and adherence to existing medical and fitness standards, while Initiative 2 focuses on empowerment of all members of a department to be involved and engaged with departmental health and safety while around the station, while responding to and returning from calls for service, and while operating at emergency scenes.

The initial research phase of this study was directed toward clearly identifying and defining the problem. There is widespread acceptance of the presumption that behavioral issues contribute to both firefighter injuries and LODDs and that some type of cultural change is needed to alter the perceptions of acceptable and unacceptable risks. The objective of the research effort is to narrow the focus to identify the particular behaviors that need to be addressed.

The NSCCI project is aimed at identifying the aspects of fire and emergency service culture that contribute to preventable occupational illnesses, injuries and fatalities and subsequently changing those cultural norms that either promote or tolerate excessive risk behaviors. The Project Team developed this document based on the perspec-

tive that the expansion of a more appropriate safety culture should not be seen as a challenge to the overall fire service nor contrary to the mission of saving lives and protecting property. This document focuses on integrating safety into the fire service culture without diminishing any of its existing positive aspects.

It should be mentioned that understanding fire and emergency service culture as it relates to fire prevention activities is also important, although this project does not include that perspective.

Throughout this paper, the term fire and emergency service is used to broadly capture any type of emergency response organization that responds to fires or other crises that erupt in communities throughout the U.S. An effort was made to be inclusive of nonfirefighting areas, but there is little literature available that looks broadly at emergency services that are not directly engaged in firefighting. However, a study produced under a cooperative agreement between the National Highway Traffic Safety Administration (NHTSA), with support from the Health Resources and Services Administration's (HRSA's) Emergency Medical Services for Children (EMSC) program, and the American College of Emergency Physicians (ACEP) looks specifically at an "EMS Culture of Safety" and can be accessed at http://www.emscultureofsafety.org/wp-content/uploads/2013/10/Strategy-for-a-National-EMS-Culture-of-Safety-10-03-13.pdf.

Photo by Ron Moore, Courtesy of Cornbelt (Illinois) Fire Protection District

## Understanding the Fire and Emergency Service Culture

From the origins of an organized fire and emergency service in the U.S. through the early 1970s, very little attention was directed toward firefighter safety (Granito, 2003); the inherent risk factors of firefighting and emergency operations were recognized and simply accepted as unavoidable occupational hazards. Generations of firefighters were subjected to extreme risks, in most cases because their mission was considered essential and there were few alternatives available to them. The image of the firefighter, which is the foundation of the fire and emergency service culture, was built around selfless heroism — the firefighter is always ready to face any risk and, if necessary, to make the supreme sacrifice in order to save lives and property.

Serious efforts to address firefighter safety began during the 1970s and expanded significantly through the 1980s and 1990s, coinciding in part with major advances in protective clothing and equipment, as well as the development of more effective tools and procedures that allowed for fire suppression operations to be conducted with better calculated risks to the firefighter. During that time period, operational procedures began to incorporate firefighter health and safety as primary objectives, on a par with saving civilian lives and as a higher priority than saving property (Linke, 2008). National Fire Protection Association (NFPA) 1500, *Standard on Fire Department Occupational Safety and Health Program* was published in 1987 as the first consensus standard to address occupational safety and health for organizations delivering emergency services.

The NSCCI project is directed toward this particular aspect of the effort to further reduce LODDs, as well as decreasing occupational injuries and illnesses within the fire and emergency service. It is intended to identify and examine the factors that cause or influence firefighters to make decisions and engage in actions that involve unnecessary and avoidable risks, which often places their own lives, and potentially the lives of their fellow firefighters, in danger when there are less dangerous options available. Expressing the concept in terms of risk management, this would refer to situations where the potential gain is out of balance with the potential loss.

This paper and its proposed strategies for reducing risk-taking behaviors in the fire and emergency service are based on a literature review, focused discussions, and the experiences and collective knowledge of members of the Project Team and reviewers.

## What Drives Firefighter Behaviors?

U.S. society as a whole may contribute to the risk behaviors that are demonstrated within the fire service. Communities expect an urgent and timely response to emergencies and disasters with fully trained individuals arriving on adequately staffed apparatus. However, public knowledge of the complexities and challenges of building, maintaining and delivering such service capabilities is often transparent or invisible to those funding the services until the system fails to meet public expectations. Some fire and emergency service organizations do not have the resources to implement advanced training programs or provide training beyond that which is minimally required for each position.

Firefighters who are questioned in relation to their high-risk behaviors often refer to either public or organizational expectations of selfless heroism. Such perceptions are consistent with the popular image of the firefighter as a daring individual who is willing to risk life and limb to save the life of a total stranger and who is lauded for doing so.

Those with a traditional outlook often express disagreement with the emphasis that has been directed toward "acceptable risks" and "rules of engagement," claiming that they promote nonaggressive and ineffective operations. The opposing viewpoint asserts that there are times when it is appropriate to be boldly aggressive and times to be intelligently cautious. The focus of this paper is to seek out areas where the level of safety in the provision of a fire and emergency service organization can be improved without diluting or lessening the critical mission of service delivery.

## Examples of Inappropriate Risk Behaviors

Firefighters are routinely called upon to deal with situations that involve risks that could result in their death or injury or contribute to an occupational illness or disability. Several of these risk factors are inherent to the nature of the work that firefighters perform; however, the level of exposure to those risks varies depending on decisions that are made and actions that are taken — or not taken — when faced with a particular situation and set of circumstances. A general risk management philosophy in the fire service is risk a lot to save a lot, risk a little to save a little, and risk nothing to save nothing (Linke, 2008).

Most of the discussion of risk exposure is written in the context of structural firefighting, where the concepts of offensive versus defensive strategy are easily defined. Offensive strategy places firefighters in close contact with the fire, inside the burning building, and involves a certain level of inherent risk. Defensive strategy keeps firefighters outside, in what should be safe exterior locations, to minimize risk. This concept requires some extrapolation to be applied to other emergency responses and scenes.

While the Incident Commander's (IC's) decisions establish a theoretical level of acceptable risk that applies to every individual involved in an incident, at times, individual firefighters knowingly or unknowingly expose themselves to higher levels of risk than the IC has deemed acceptable. This is a particular problem when individual perceptions of acceptable risk are different from the IC's perceptions.

Fire and emergency service organizations should concentrate on implementing and demonstrating an effective and measurable model of firefighter training. This model supports and emphasizes the behaviors learned during initial firefighter training (recruit training) and continuously builds upon those experiences to build advanced skill sets throughout their service as a firefighter/EMS provider. This training should subscribe to the philosophy that health and safety are the capstone of any model. The focus areas of risk behavior modification are education, training, health and wellness.

With regard to vehicle operations for both personally owned and agency-owned vehicles, fire and emergency service organizations should concentrate on implementing and demonstrating an effective and measurable model of driver/operator training that advances skill sets throughout tenure as a firefighter, ensures quality, and provides for driver/operator accountability. The focus areas of risk behavior modification are driver capability, quality assurance and accountability.

Fire and emergency service organizations must also focus on moving toward compliance with national standards for health and wellness, fitness for duty, and emergency scene rehabilitation.

In each of these cases, scenarios can present themselves where emergency responders act without a full understanding of the potential scope and fallout from their actions, leading to illness, injury or death that is out of alignment with the potential value of the chosen action.

## What Is Culture?

To change the undesirable components of fire and emergency service culture, one must first understand the broad construct of culture and then apply this framework within the fire and emergency service. Schein describes the culture of a group as the "basic, shared, assumptions" learned by a group as it solves problems (2004, p. 17). He indicates that when this problem-solving is successful, the methods are taught to new members as correct solutions to the problems (Schein, 2004). Hofstede refers to these methods and assumptions as the "collective programming of the mind" (2001, p. 1). Kluckhorn similarly defines culture as "patterned ways of thinking," based upon traditional and historical ideas (1951, p. 86). All three of these definitions identify culture as a process that occurs in the individual, based upon learned behaviors that are influenced by a group and the group's history.

Culture is reflected in a group's internal characteristics, its character, and its daily existence (Goodman, Zammuto, & Gifford, 2001). It is influenced by organizational history, policies, uniforming, facilities, vocabulary, leadership and management within an organization (Compton, 2003). Uniformed professions, such as police departments, fire and emergency service organizations, and military units, have such unique cultures unto themselves that they have characteristics, such as a sense of duty and allegiance, that are not found in such a strong degree in other professions.

"Culture can be difficult to substantively define, but culture truly describes how things are done in the [fire and emergency service] organization" (Compton, 2003, p. 24). This comment may allude to how entwined the culture of the fire and emergency service organization is with all aspects of the operations and delivery of services. The culture impacts how the firefighters interact with each other, from where a firefighter or officer sits at the dinner table, which seat they can occupy in the TV room and when they may sit down, where they sit on emergency apparatus and what their roles at emergency scenes will be, to how they may interact with other members of the company. While these rituals and values have some commonality across the different fire and emergency service organization types and sizes throughout the U.S., it would be both inaccurate and irresponsible to assume that these traits and values are reflected identically in all fire and emergency service organizations. However, since the fire and emergency service functions as individual organizations within the framework of a larger organizational culture, there should be some common themes and values that are present throughout most fire and emergency service organizations.

Uniformed organizations, such as fire and emergency service organizations, represent "specific occupational cultures that are relatively isolated from society" (Soeters, 2000, p. 465). Archer (1999) supports this with his assertion that the fire and emergency service is "characterized by its strong culture," which includes the use of a uniform, hierarchical command structure, promotion solely from within the existing ranks, and long-standing traditions (p. 94). Fire and emergency service organizations further differ from other organizations/businesses in that they are exposed to uncommon levels of danger, work unusual or shift schedules, require a great deal of physical and mental stamina from their members, and can recall staff and cancel their prescheduled leave due to emergencies or staffing shortages (Soeters, 2000).

This culture of the fire and emergency service has evolved through a complex process of group learning (Thompson & Bono, 1993). This group learning occurs during training, emergency responses, downtime around the fire station, and informal activities, such as cookouts, meals at the department, storytelling, and watching TV. In some cases, in the fire and emergency service, methods espoused as solutions may be incorrect, but they are perpetuated because they are viewed as traditions (Gasaway, 2005). Pessemier supports this in his 2008 discussion of improving fire and emergency service organization safety by stating:

> "Normalization of unsafe practices can also occur as a result of the fact that other individuals take the same [incorrect or unsafe] actions. If, in general, nothing bad happens as a result of unsafe practices, and if everyone else in the organization participates in the same practices, then these practices become part of the normal and accepted way of accomplishing tasks. As a result, Fire and Emergency services organization history and traditions can create a culture that is difficult to change" (2008b, p. 3).

In June of 2007, nine firefighters from Charleston, South Carolina, were killed in a fire in a large furniture store. The analysis of operations of the Charleston Fire and Emergency Services organization revealed that, among many factors, "The culture of the Charleston Fire Department promoted aggressive offensive tactics that exposed firefight-

ers to excessive and avoidable risks and failed to apply basic firefighter safety practices." As a result, in the initial report on changes that need to be accomplished in the department to prevent a reoccurrence of a similar tragedy, one of the highest priority items is a change to the department's "Culture and Leadership" (Routley, 2007).

In addition to the number of fatalities, it is important to consider the number of on-the-job injuries that firefighting contributes to annually. NFPA reports that in 2012, there were 69,400 job-related injuries. Peterson identifies over 95,000 injuries per year (2010), and Houdous, Pizatella, Braddee and Castillo support this with a calculation of 90,000 injuries per year, with an increasing rate of injury in the fire and emergency service (2004). Brennan (2011) extracted from NFPA the number of on-scene emergency injuries to be 32,205 in 2009 and compared these to the number of members of the U.S. military who were wounded in combat. In the period from October 2001 through August 2008, there were 30,568 U.S. service members wounded in action — less than the number of firefighters injured in the single year 2009 (Brennan, 2011). It should be mentioned here that the likelihood of all on-the-job injuries and related illnesses being reported consistently is suspect and that the numbers are probably higher.

## Aspects of the Culture

Being service-focused, having a strong identity and role in the community, and being willing to accept risk are all positive traits when they exist in an environment that is safety-focused (Compton, 2003).

Before discussing some of the negative traits that have been documented about the culture of the American fire and emergency service community, one must remember that no culture is all good or all bad. Traits offered in this paper are to further the point that a change is necessary, so more of the negative traits are elucidated. Additionally, there are more examples in the peer-reviewed literature of the failures of the culture, as these events tend to receive more attention than the daily successes and examples of positive action. According to Brunacini, the original firefighters in colonial America in 1740 were selected to protect their community based on their ability to do three things: (1) They had to be **fast**, to get to emergencies in a minimum amount of time; (2) they had to be willing to take great personal risks to get **close** to the fire; and (3) they had to be able to put water on the fire, to get the fire **wet** to extinguish it (1998). Brunacini identifies these three traits as the core tenet of even the modern firefighter's culture, even though actions should be more measured and risks should be better assessed in this modern age. Firefighters should operate in full protective clothing and within an accountability system in the performance of their duties (1998). Having a fire and emergency service that embraces the notion of "fast/close/wet" may misalign with the goal of operating safely. Clark furthered Brunacini's message by adding that if firefighters continue to ascribe to fast/close/wet as the way to respond to fire emergencies, the inevitable result is risk, injury and death (2011).

Firefighter fatalities are closely linked to unsafe practices and a fire and emergency service culture that is not fully committed to safety (Cross, 2010). This lack of commitment to safety is not a new problem in the fire and emergency service. In 1973, the National Commission on Fire Prevention and Control published the landmark study "America Burning." This initial look at the fire problem in the U.S. revealed that 6,200 people, including firefighters, died annually as a result of hostile fire (Bland, 1973). Additionally, over 100,000 injuries were reported annually, with a dollar loss of over $10 billion (in 1973 dollars) (Bland). The report estimated a nationwide rate of 300 fires per hour, which translates to over 2.7 million fires annually. In 2007, there were less than 1.6 million fires in the U.S., leading to 3,430 fire deaths and a property loss of $14.6 billion (Federal Emergency Management Agency (FEMA), 2008). This represents a 44 percent reduction in the number of civilian deaths from fire, and a 40 percent reduction in the number of fires overall. During that same time period, there was no reduction in the number of firefighters who died in the performance of their duties.

In 2011, Kunadharaju, Smith and DeJoy conducted an analysis of 189 National Institute for Occupational Safety and Health firefighter fatality reports for the time period 2004-2009. They found that there were four higher-order causes of firefighter death and injury: insufficient resources, inadequate preparation, insufficient incident command structure, and suboptimal personnel readiness (Kunadharaju, Smith & DeJoy). They concluded that these four higher-order causes "may actually be tapping the basic culture of firefighting … the job must get done, get done as quickly as possible, and with whatever resources are available" (p. 179). They also advocated for additional research in the area of defining the culture of the fire and emergency service.

As has been shown for other occupational safety problems, the true root causes of many firefighter fatalities may be traceable back to basic cultural attributes (Pidgeon & O'Leary, 2000). The focus on culture as a factor in firefighter fatalities is not new, with IAFC, NFFF and the International Association of Fire Fighters being three high-profile organizations identifying culture as a critical area for change within the fire and emergency service. Various task forces and panels have called for culture change within firefighting organizations. What is new here is an initial attempt to probe for cultural symptoms using a very important and valuable data source: firefighter fatality investigations. Although the conclusions presented in the present research are not in any way definitive or final, they do highlight the importance of cultural factors in firefighter line-of-duty fatalities and suggest some specific factors that should be examined in future research.

David Archer concurs with this description of the fire and emergency service culture, and elaborates on what he calls the discipline code, which "is highly prescriptive, promotes ... from within the organization only ... has long standing traditions, and is predominantly white-male dominated" (1999, p. 1). He further discusses that this system is perpetuated through the cultural processes that individuals are introduced to when they go through the paramilitary-style initial training.

Baigent identified five key areas of culture that are common in interactions between firefighters (2001, p. 7):

1. Ostracizing anyone different.
2. Ostracizing anyone who doesn't conform.
3. Bullying and threatening anyone who resists the dominant group.
4. Excluding outsiders from fire station life.
5. Frequent joking as an instrument to continue bullying.

Brunacini's description of the treatment of new firefighters who don't follow the direction of the older firefighters is consistent with Baigent's criteria.

Lewis, a scholar studying issues of gender and racial inequity in firefighter selection and training, juxtaposes the image of firefighters as heroes against the culture of firefighting: "Firefighters around the world are heroes in the hearts and minds of the public. ... However, research into the culture of firefighting worldwide has also shown disturbing and quite 'uniform' characteristics have been normalized by many under the guise of tradition" (2004).

Phillip Schaenman conducted a study of over 1,000 firefighters' attitudes and perceptions regarding safety in the wildland firefighting environment. Respondents described the culture as being one "of hardship, adventure, close friendships, and commitment; experience over rank ... enjoys stories of conquest and danger," and pride at how different a wildland firefighter's life is from the rest of society (1996, p. 193). One respondent described the culture as one with "long traditions" (p. 196). These varied descriptions of aspects of the culture make up the tightly woven fabric of the American fire and emergency service community that bears closer investigation and analysis. Organizational cultures such as this are more complicated and have a greater impact on decision-making than insiders to the culture typically realize (Vaughan, 1997). Organizational values within the fire and emergency service are the "shared standards and core beliefs that guide decisions and actions within" the fire and emergency service (Cochran, 2006, p. 454).

## Cultural Change

It is evident that many interrelated factors must be addressed in order to produce a significant change in outcomes in terms of reducing line-of-duty injuries and deaths and improving overall firefighter safety and health. The existing fire and emergency service culture, as it relates to occupational safety and health, was identified as both a cause and an effect of the current situation. A cultural change would set the stage for many incremental changes that would produce the desired positive impact.

Cultural researcher Edgar Schein identified the fundamental components of an organizational culture as a system of shared behaviors, values, assumptions and beliefs (2004). He describes these components as a three-layer system:

- Assumptions and beliefs.
- Values.
- Behaviors.

This model begins with a system of shared assumptions and beliefs that provides the foundation for organizational values. Those values, in turn, create expectations for acceptable and unacceptable behaviors. To apply this model to one particular aspect of the fire and emergency service, it could be stated that firefighters tend to attack fires in a manner that is bold and aggressive because their value system provides positive recognition for this type of behavior. These values are based on the belief that the mission of the fire and emergency service is to extinguish every fire as quickly as possible and the assumption that the best way to control a fire is to hit it hard and fast.

All three layers of this model were described by the symposium participants in the discussions that produced the 16 FLSIs. It was noted that unsafe attitudes and behaviors often prevail in spite of the common knowledge that there are less risky alternatives that could result in fewer deaths, injuries and illnesses. In fact, it was noted that efforts to promote health and safety were often met with resistance and scorn, reinforcing the notion that they created conflict with established attitudes, assumptions and values.

The existing system of assumptions and beliefs reinforces particular values:

- Every LODD is automatically labeled as heroic, no matter the circumstances (versus an occupational fatality that is preventable).
- Recommendations to follow standard operating procedures and exercise appropriate caution are described as cowardly.
- The urgency of quickly arriving at the scene of an emergency justifies driving in a manner that endangers the lives of other motorists and pedestrians who may be encountered en route, as well as the responders themselves.

The same sense of urgency:

- Justifies attempting to don protective clothing and equipment en route as opposed to being properly seated and belted in an approved riding position.
- Allows inadequately trained drivers to operate emergency vehicles.
- Allows poorly designed and poorly maintained vehicles to be operated.

The three-layer model suggests that cultural change has to occur progressively, beginning with changes in assumptions and beliefs that gradually bring about changes in the values that are accepted and shared by the individuals within an organization. Changes in the organizational values legitimize and promote changes in behavior. These behaviors need to be reinforced by an ongoing commitment to safety culture at the organizational level and among individual firefighters and their crews. This three-stage process is described as the most natural and effective manner of accomplishing a cultural change.

The application of this approach to the firefighter safety issue suggests that the first priority should be to convince individuals, companies, departments, and society as a whole that the current rates of death and injury are unacceptable and that operating with a higher regard for safety would not compromise the mission of controlling fires and saving lives. The large-scale acceptance of these new assumptions and beliefs would lead to a change in the value system so that being safe would be given equal weight to being effective in controlling fires and saving civilian lives. The new values would encourage firefighters to be more careful and to stop engaging in reckless behaviors that lead to preventable deaths and injuries.

It is also possible to work in the opposite direction, from the top down, although this approach is much more likely to encounter resistance. Every fire chief has the ability to establish rules and regulations that require changes in behavior within his or her own fire and emergency service organi-

zation. For example, the consistent enforcement of a strict policy requiring the use of seat belts in fire apparatus would probably, over a period of time, result in a change of values — at least with regard to seat belt use. Ultimately, the members of the fire and emergency service organization would come to accept and integrate seat belt use as part of their organizational culture.

Members of the fire and emergency service, especially fire chiefs, must align their personal values with the organizational values, and they must model these values (Cochran, 2006). The leader must then ensure alignment of values within the organization in order to ensure a strong work ethic; appropriate treatment of stakeholders; a cooperative atmosphere; teamwork; and high levels of dedication, discipline and commitment (Cochran). Therefore, not having a description of the values or culture makes it difficult, if not impossible, for a leader to initiate organizational change, since there is a limited baseline upon which to center the change interventions.

The difference between the two approaches is that the bottom-up strategy should enable much more comprehensive changes in behavior once the new values become accepted, especially since firefighters would be involved with identifying solutions (and doing so could bolster their buy-in). The top-down approach is likely to encounter resistance for every individual change in behavior that is introduced. The large-scale cultural adjustment may eventually be accomplished; however, it is likely to be a slow and lengthy process.

The statement within FLSI 1 that the cultural change must incorporate leadership, management, supervision, accountability and personal responsibility is an expression of the need to address the process with a unified effort at every level in order to accomplish the objective, working from the bottom up and from the top down. The successful insertion of occupational safety and health into the fire and emergency service value system should support numerous behavioral changes that could lead to a significant reduction in occupational deaths, injuries and illnesses.

## Resistance to Change

Resistance to change, even change initiated internally, is often cited as a significant characteristic of fire and emergency service culture. This factor is often expressed with a mixture of pride and amusement by slogans such as “200 years of tradition unimpeded by progress” (Fire Department of New York (FDNY)).

Resistance to external influences is sometimes described as a particular characteristic of the American fire and emergency service culture. Although it is evident that more and more external influences are demanding compliance and adjustment, particularly in relation to occupational safety and health, there is no question that the fire and emergency service culture strongly resists being told what to do.

These factors underline the point that the type of cultural change that is the target of FLSI 1 will require significant adjustments to some of the values and beliefs that are commonly associated with fire and emergency service culture. This can only be accomplished by convincing firefighters at every level that the change is both desirable and necessary, and that the adjustments may be accommodated without compromising any of the highly valued aspects of fire and emergency service culture.

## Toward a Safety Culture

The culture of the American fire and emergency service community is a contributing factor to the high incidence of injury and death. Daniels (2005) asserts that until the fire and emergency service is willing to make substantial changes in training, procedures, equipment and recruiting, this fatal trend shall continue. In some cases, the injurious behaviors may have originated as a bad habit that evolved slowly over time into a tradition, slowly injecting a poor practice or dangerous procedure into the fire and emergency service organization over generations (Gasaway, 2005). Firefighters may engage in an unsafe act, thinking it is the correct way to operate or behave because the unsafe act or technique was how they were originally instructed (Gasaway). Storytelling and instruction from an older generation of firefighters to a younger generation of firefighters is a trait of the tightknit culture. This can be advantageous when the information is appropriate and relates to current department operating guidelines and situations, but it can be detrimental when there is no "filter" to ensure that the hand-me-down messages are safe and effective (Schaenman, 1996).

An additional issue cited by Pessemier is that "the U.S. Fire and Emergency Service does not have an institutionalized methodology for managing safety" (2008b, p. 1). He identifies this as a conflict between the organizational mission of the fire and emergency service and the view of safety as completing demands, instead of synergistic values.

Schneider (1973) suggests that cultures should be "for" something, for example "for service" or "for safety." One possible solution to the American fire and emergency service community's dilemma of how to change this culture is to develop an understanding of what it is and then refocus it to be "for" a different value or concept. Slight shifts in the practices within the fire and emergency service are likely to be more successful than large, sudden change (Daniels, 2005b). Schaenman identified that firefighters recognize the importance of safety, but they aren't always sure about how to accomplish an activity safely (1996). Incrementally moving the current values, and therefore the culture of the fire and emergency service, toward a safety culture can provide the framework and strategies for how to address both of these potential issues.

A safety culture reflects the values, norms, assumptions and expectations regarding safety (Mearns, 1999). A company's safety culture is expressed by management's safety practices, which are reflected in the workplace safety climate (i.e., employees' perceptions, attitudes and beliefs about risk and safety) (Mearns, 1999). A positive safety culture, as part of comprehensive safety improvement interventions, has been shown to influence safety behaviors by maximizing employee motivation and improving safety knowledge, which, in turn, helps to improve employee compliance, thereby resulting in safer behaviors and fewer injuries.

Pessemier (2008a) furthers this notion of moving toward a safety culture in the fire and emergency service. For illustration, the Phoenix Fire Department has shifted from a transactional service model to one of building longer-term and deeper relationships by shifting the focus of its culture from "for service" to "for building long-term relationships" (Schneider, Bowen, Ehrhart, & Holcombe, 2000). This ability to change a culture in the fire and emergency service is supported by Hofstede, who states that an organizational culture is easier to change than a national culture (2001).

The culture of the U.S. could be modified toward a safety culture. The nuclear industry coined the term following accidents at Chernobyl in 1986 and at Three Mile Island in 1979 and used it to describe what was lacking in these two events. It is a concept that encompasses "a combination of managerial, organizational, and social factors" that contribute to accidents and near misses (Freimuth, 2006). Once cultural goals and expectations were identified, they were reinforced by managers to instill and then reinforce these changes. Regarding culture in the American fire and emergency service community, it has been said that "without the emergence of a new safety culture, all attempts [at increasing firefighter safety] will be in vain" (Siarnicki, 2010, p. 9).

Climate exists within a culture, so moving toward a safety culture would require movement toward a safety climate. While the main focus of this paper is cultural (versus climate) change, it is worth acknowledging the concept of climate and its close relationship to culture while differentiating the two concepts. Safety climate is not only a set of values, beliefs and perceptions about safety as a concept, but also the policies, procedures and practices that support safety in an organization (Colley, Lincolne, & Neal, 2013; Goulart, 2013). Climate is more temporal and local to a particular unit, whereas culture is broader and spans the entire organization, and in some cases, the profession (Mortenson, 2014).

One of the gradual shifts that can be made from the current culture toward a safety culture is to focus on fire-safe behavior, shifting away from heroic acts. Alan Brunacini, former chief of the Phoenix Fire Department and a firefighter there since 1958, describes the problem with the current nonsafety culture that focuses on heroic acts in this way:

> "For 225 years, it was OK for a burning building to kill us. When the fire kills us, our department typically conducts a huge ritualistic funeral ceremony, engraves our name on the honor wall, and makes us an eternal hero. Every Line of Duty Death gets the same terminal ritual regardless if the firefighter was taking an appropriate risk to protect a savable life or was recreationally freelancing in a clearly defensive place … Genuine bravery and terminal stupidity both get the same eulogy. Our young firefighters are motivated and inspired to attack even harder by the ceremonialization of our battleground death" (2008, pp. 6-7).

By emphasizing actions that violate safety guidelines and awarding firefighters for heroic acts that come at a greater-than-usual level of risk or unnecessary danger (Walton et al., 2000), the message being communicated within the culture is that these types of behaviors are acceptable and will be rewarded. "Most of the awards for valor usually involve … doing things you aren't supposed to do. It's in our nature to want to save someone. If nothing goes wrong despite ignoring the rule, you'll be praised for saving someone" (Peterson et al., 2010, p. 27). Brunacini explains this disregard for safety by suggesting that today's firefighters "… have never stopped hearing Ben [Franklin]'s voice tell them to be Fast/Close/Wet when they are responding to a fire. I think this is what culture really means in the current safety discussion" (2008, p. 9). Firefighters need a safety culture message that speaks louder than Ben Franklin's whispers to effect a change within a system that promotes and rewards appropriate risk management behaviors.

A concise summary for the role of culture in the fire and emergency service is provided in this quote from the Charleston, South Carolina, report on nine firefighters killed in 2007: "The cultural lessons may be the most important and also the hardest to embrace" (Laws, 2008, p. 64). Making sense of cultural lessons such as this requires a solid understanding of the organization's history (Hofstede, 2001). While much of the work on injury and fatality reduction in firefighting has focused on technology and increasingly more stringent regulations, little has focused on the culture.

A closing thought from Hofstede (2000) serves as a fitting end to the discussion of the organizational culture and values in the fire and emergency service and the need for a shift in this culture to reduce on-duty fatalities. "Uniformed organizations have to balance their attempts to introduce new ways of working … with the necessity of preserving traditional basics. Changing uniformed cultures requires patience and wisdom" (p. 481). It is the intent of this research to develop some of the wisdom necessary to effect a positive change in the fire and emergency service by reducing the number of on-duty deaths through first understanding the existing values of the fire and emergency service.

## Areas of Focus for Cultural Change in Fire and Emergency Services

Thus far, this report has defined culture, described the origins and characteristics of the culture of the American fire and emergency service community, and made a case to move toward a safety culture. The staggering death and injury toll within the fire and emergency service has also been detailed, and from that description, it is clear that the losses experienced are disproportionate to the decreasing number of fires in the U.S.

The culture of unsafe practices may be so deeply ingrained that efforts to change are viewed as challenges to fundamental beliefs, while other unsafe practices are created by the culture of the fire and emergency service as a whole. Still other behaviors, which are not cultural or motivational, are the result of an individual's health or family history. The Project Team focused on the changes that could be standardized and easily implemented within an organization to effect change.

Using the focus areas and their objectives, the Project Team concentrated on developing sets of behaviors for chief officers, Company Officers (COs) and firefighters that minimize risk. These behaviors were derived using a frequency analysis and consensus of the working group. Risk-taking behaviors have been shown to be an organizational problem and not one that lies solely with firefighters' behaviors; therefore, strategies to change firefighter behavior need to address multiple levels of influence. The working group identified the following areas of focus: situational awareness, individual responsibility, leadership, health and wellness, training, vehicle operations, seat belt usage, recruiting, and environmental factors.

## Situational Awareness

Fire and emergency service organizations should concentrate on implementing and demonstrating an effective and measurable model to improve situational awareness of all responders, along with the command and control of all incidents. One way to encourage this change is for fire and emergency service organizations to draw on a risk management approach that obtains input from firefighters and involves a cyclical process of identifying operations or activities that pose high risk for injuries, redesigning operating procedures to reduce risks, implementing these changes, and evaluating their impact. The focus areas of risk behavior modification are situational awareness and inadequate command, control and supervision.

There is considerable room for discussion in defining the boundary limits for acceptable and unacceptable risk in relation to potentially survivable or nonsurvivable conditions, and increased situational awareness aids in establishing these limits. Situational awareness is defined as "the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future" (Endsley M., 1988).

The study of decision-making with its many subsets, including situational awareness, is at its core: the study of human factors and human error. It is the study of complex interactions of human behavior and the consequence of those actions. One area of scholarly agreement is that understanding of the complex interaction between human causal factors is always likely to see changes, though it is imperfect and incomplete (Wall, 2012). S. Dekker points out that some labels, such as complacency or loss of situational awareness, are a better and more accurate description of events than labeling an accident as human error; they appear to give a reason behind the behavior. In high-risk occupations that have already failed to predict complex situations, it is nearly impossible to completely engineer all safety mechanisms; thus, human decision-making must be studied and well-understood (Dekker, 2002).

Situational awareness becomes a key factor in cases where it is not known whether a building is occupied or unoccupied and whether the occupants are still alive or already deceased. Should firefighters risk their lives to search for potential occupants under extreme fire conditions when there are no clear indications that the building is occupied, or where fire conditions suggest that it is extremely unlikely that anyone could be saved?

Photo by Ron Moore, Courtesy of Cornbelt (Illinois) Fire Protection District

Photo by Ron Moore, Courtesy of Prosper (Texas) Fire Rescue

## *Individual Responsibility*

The two key aspects that apply to every member of the fire and emergency service at every level are accountability and personal responsibility. Every individual, from entry-level firefighter to fire chief, must be accountable for meeting the expectations assigned to his or her role and position within the fire and emergency service. All individuals must also accept personal responsibility for their own health and safety, as well as for that of their co-workers and particularly for that of anyone they supervise.

Accountability is an inherent aspect of management and supervision, expanding at each successive level of hierarchy. The fire chief cannot avoid accountability for the overall performance of the fire and emergency service organization and for every positive or negative occurrence. The fire chief must hold subordinates accountable for performance within their areas of responsibility. The same principle applies to every level, down to the individual firefighter who is accountable to the organization as a whole but directly accountable to a supervisor and usually also to a group of co-workers.

Accountability is often ignored until something bad happens — in this case, an incident that results in on-duty injury or death. Positive accountability is associated with ensuring that all of the proper policies and programs are in place to prevent this type of occurrence, whereas negative accountability begins with attempting to explain why they were not in place after a preventable event has occurred. **The most undesirable type of accountability comes from outside an organization, when individuals have to defend the organization, or even themselves, in legal proceedings.**

Photo by Ron Moore, Courtesy of Prosper (Texas) Fire Rescue

## *Leadership*

Leadership is often mentioned as a key component in relation to implementing safety policies and programs. Change is unlikely to occur unless the leaders of an organization embrace the effort and demonstrate a commitment to the endeavor. This applies directly to the formal leadership, which includes labor as well as management, and it often includes informal but influential leaders within the organization.

Effective leadership must go beyond simply issuing directives and policy statements. The members of a fire and emergency service organization can generally differentiate between policies that are intended to satisfy a duty or responsibility and legitimate efforts to lead the organization in a specific direction. There are many examples of fire and emergency service organizations that have issued policies that are based on recommended safety and health standards and then failed to demonstrate a true commitment to those policies.

### Health and Wellness

Almost half of all firefighter fatalities in the U.S. are cardiac-related (USFA), and the majority of those deaths are found to be related to pre-existing and preidentified medical conditions. These factors reinforce the message that all firefighters should be periodically evaluated to ensure that they are medically and physically fit to perform their expected duties. This message is incorporated within NFPA 1500. It is also expressed in FLSI 6, which states: **Develop and implement national medical and physical fitness standards that are equally applicable to all firefighters, based on the duties they are expected to perform.**

Although the message is clearly stated and its importance is widely accepted, the American fire and emergency service community has been very slow to adopt mandatory policies to implement such requirements. The necessary standards have been developed and adopted, yet there are still fire and emergency service organizations without programs of this nature and tens of thousands of active firefighters who have not been medically certified for emergency duty.

The two primary factors that inhibit the adoption of mandatory medical and fitness standards are cost and the belief that a substantial percentage of fire and emergency service members would be unable to meet the requirements. This behavioral aspect reflects the determination of many individuals who join the fire and emergency service or who continue to serve in spite of their medical status and physical fitness limitations. Indeed, many fire and emergency service organizations would face a serious crisis if the recommended policies were immediately mandated, as they may lack the resources to medically screen all personnel and to recruit new members to replace those who are found to be ineligible for service.

Cost is a significant problem for the various types of fire and emergency service organizations; however, the potential loss of active members may be a more critical concern for many volunteer fire and emergency service organizations that are already dealing with recruiting and retention issues and don't have the added incentive of pay to bring new recruits in. In addition, volunteer fire departments face additional barriers, such as the fact that they typically do not provide health insurance for their members, they typically don't have access to a department doctor, and departments in

rural areas may not have easy access to medical resources. Within the career fire and emergency service, the concern tends to be associated with the fate of career employees who are determined to be unfit for duty.

The individual determination of many fire and emergency service members to remain active in physically demanding positions in fire and emergency service organizations, in spite of risks to their own health, is evident from the half of LODDs that result from medical causes. This behavior may be driven by dedication to the fire and emergency service mission, as well as the sense of membership within the fire and emergency service community.

## Training

While training is often viewed as an essential component to accomplish any type of positive change in firefighter behavior, it is also frequently noted that inappropriate training is encouraging or reinforcing high-risk behaviors. This suggests that the problem may not be limited to inadequate training; it may also involve applicable training that establishes inappropriate attitudes, actions, beliefs and behaviors.

Fire and emergency service training organizations must be conscious of the behavioral influences that are incorporated within the content of their training programs, as well as the manner in which training is being delivered. The attitudes, beliefs and behaviors of the instructor may be more influential than the program content itself.

In addition to ensuring that the intended content is delivered and the desired attitudes and behaviors are developed, it is essential to ensure that training activities are conducted with a high degree of safety. The annual reports of firefighter fatalities almost invariably include deaths associated with training activities, whether from traumatic injuries or medical causes. The latter category often includes overexertion, heat stress, and a variety of known and unknown medical conditions.

## *Initial Firefighter Training*

Firefighter competency is foundational to firefighter safety. Training for firefighters (NFPA 1001, *Standard for Fire Fighter Professional Qualifications*) should include educational components that discuss the new science and research now available, including fire behavior based on factors such as fuels present, the limitations of PPE, and the limitations of the human body when fighting fire in the new protective ensembles. Back to basics isn't more hose evolutions — it is the **why** behind what we do. Fire and emergency service organizations should continue to monitor research and the ensuing evidence to adapt/update protocols and practices that improve safety and fire protection. Firefighters should be taught to evaluate the risk of every action so they never have to answer "I don't know" when asked why they took a particular action. Firefighters should not take action without knowing the possible consequences.

The fire and emergency service has seen and heard of presentations based on the Underwriters Laboratory (UL) and National Institute of Standards and Technology (NIST) research conducted with the Chicago Fire Department; FDNY; Spartanburg, South Carolina Fire and Rescue; and others that suggest a change to traditional first-arriving actions. These research reports, based on science, suggest changes to the initial on-scene report and operational mode, which are designed to limit exposure to risk, that include "aggressive defensive operation being performed in preparation for an interior attack."

The UL and NIST live burn tests are aimed at quantifying emerging theories about how fires are different today. This difference is largely due to new building construction and the composition of home furnishings and products that in the past were mainly composed of natural materials, such as wood and cotton, but now contain large quantities of petroleum-based products and synthetics that burn faster and hotter. Whereas a fire in a room once took approximately 20 minutes to experience "flashover" — igniting all the contents — this can happen with today's products in as little as four to five minutes.

The primary motivation for the live burn experiments is the changing dynamics of fires. The contents of American homes have changed significantly in the past few decades. Plastics and other synthetic materials have replaced the natural materials that once made up the bulk of furniture items. In addition, modern living spaces tend to be more open, less compartmentalized and better insulated than homes built years ago, leading to increased fire spread in "modern dwellings."

The UL/NIST studies suggest that a change in traditional tactics begins with a direct exterior attack, making the interior safer for entry when the interior attack begins. This is being viewed as particularly appropriate in reduced staffing or delayed backup situations. These changes may pose a cultural challenge with the use of the verbiage, such as "aggressive exterior attack" instead of the traditional "defensive operation," which implies that we are giving up. Regardless of how the incident begins, in the most critical situations, the IC has to make the decision to switch from an offensive strategy to a defensive strategy and withdraw firefighters from interior operating positions based on an ongoing assessment of incident scene hazards.

## *Officer Training*

Training for COs (NFPA 1021, *Standard for Fire Officer Professional Qualifications*) should include educational components, such as health and safety, leadership, and tactics for new building construction features, in addition to those changing components for firefighters. Back to basics for COs is not simply more leadership classes — it also includes the principles of reading smoke, adequate size-up with a declaration of strategy, understanding fire behavior, building construction, victim survivability profiling, and using the Incident Command System to help manage the incident with safety as the overarching, guiding principle. COs should be asking themselves:

- "Am I training on the types of incidents to which we actually respond?"
- "Do we have experience or training on this type of incident?"
- "Is another company better trained or equipped to handle this incident?"

Training for chief officers (NFPA 1021) should also include educational components related to budgeting (execution and understanding) and maximizing partnerships to improve service delivery. Back to basics for chief officers who operate on the fireground should include skills needed for proper apparatus placement, managing multiple divisions/groups, and managing personnel accountability, in addition to those new skills being learned at the CO level.

Officers who have responsibilities for overseeing a fire and emergency service organization's health and safety program should be meeting the requirements of NFPA 1521, *Standard for Fire Department Safety Officer*. Training for such officers should include educational components, such as health and safety program management, workplace safety compliance, fireground tactics, hazard recognition, and Incident Safety Officer's responsibilities. While not every department has a designated Health and Safety Officer, it should be every officer's responsibility to function as a "safety officer" both on and off the fireground.

## *Emergency and Personal Vehicle Operation*

The operation of fire and emergency service organization vehicles and apparatus warrants specific attention. As indicated by the NFPA, during the time period 1998-2013, 13 percent of LODDs occurred while responding to or returning from calls for service. Organizations should concentrate on implementing and demonstrating an effective and measurable model of driver/operator training that advances in skill sets throughout a career and that ensures quality and driver/operator accountability. The focus areas of risk behavior modification are driver capability, quality assurance and accountability.

### Factors Influencing Safe Emergency Response

The basic nature of the emergency response mission encourages drivers to reach the scene of an incident as quickly as possible, and in the case of more rural departments, firefighters are encouraged to first reach the fire station more rapidly. Traffic laws provide specific allowances and exemptions for emergency vehicles in order to reduce response times. Sirens, air horns, warning lights, as well as larger and more powerful engines tend to increase the sense of urgency and the driver's perception of invincibility.

The two factors that are most often identified in relation to reducing emergency vehicle crashes are increased driver training and enforcement/strict adherence to safe driving procedures. The logic of these influences is self-evident; however, attention must also be directed toward the factors that encourage drivers to stretch the limits of reasonable and prudent driving habits.

In addition, response time is often used as a primary performance indicator for fire and emergency service organizations, and shaving a few seconds from the annual average response time is considered to be a significant accomplishment. All of these factors appear to justify higher levels of risk when responding in an emergency mode. Driving faster is closely associated with driving more aggressively — taking chances and forcing or challenging other drivers to yield the right of way. Excessive speed is a known risk factor for crashes and crash-related death and injury.

Additional factors have been identified as encouraging inappropriate emergency vehicle driving habits. Competition and peer pressure may encourage faster response simply to get to the scene of an incident first or ahead of a rival company. In some fire and emergency service organizations, faster response speeds have been noted when multiple companies are responding to the same incident than when only a single company is responding. At the same time, each of these factors is offset by the expectation to drive safely and with due regard for the safety of all others who may be encountered en route to the location of the emergency incident. Safety is presented as a legal and moral obligation as well as an organizational value.

Driver/Operator policies will assist every jurisdiction in establishing the guidance needed for their members to safely operate all vehicles when responding to or returning from an incident, beginning with proper licensure for the jurisdiction, as well as proper training on how to drive and operate the specific emergency vehicles that the driver will be responsible for. It is prudent that not only departmental policies but also national guidelines be established that define tiered emergency responses for all departments. These policies must address both personal and department vehicles and cover both emergency and nonemergency driving expectations.

Photo by Ron Moore, Courtesy of Prosper (Texas) Fire Rescue

Photo by Ron Moore, Courtesy of Prosper (Texas) Fire Rescue

Based on the assumption that every organization may need to create or revise driver/operator policies, a list of potential incentives that organizations can use to promote driver/operator behavioral changes and a list of possible consequences that organizations may face if they choose not to adopt a driver/operator policy are provided at www.ffsafetyculture.org.

## Seat Belt Use

The broad scope of the cultural issue becomes evident when it is applied to the question of why many firefighters do not use seat belts when riding in fire apparatus. While the adoption and enforcement of a policy requiring the use of seat belts appears to be relatively uncomplicated, the issue is considerably more complex than it appears.

The vast majority of fire and emergency service organizations have adopted official written policies that require firefighters to use seat belts whenever vehicles are in motion. There are no known written policies in fire and emergency service organizations that allow for the nonuse of seat belts. Requirements to use seat belts are incorporated in many state vehicle codes, and the same policy is clearly stated in NFPA 1500. In addition, tremendous efforts have been put forth to educate firefighters on the need to use seat belts and promote their use as a personal safety decision.

Considering all of these efforts, it is appropriate to ask why so many firefighters continue to not use seat belts. Below is a list of factors that have been identified as contributors to the problem:

- The belief that the urgency of emergency response requires donning protective clothing and equipment en route.
- The belief that a fastened seat belt will delay the firefighter's ability to exit the vehicle upon arrival at the scene of the emergency.
- The difficulty of manipulating inadequately designed seat belts in the limited seating space that is available and in the presence of breathing apparatus straps.
- The sense of personal invincibility that comes from riding in a vehicle that is larger and heavier than most other vehicles on the road.
- The fear of being viewed as nonconforming when others are not using their seat belts.
- The failure to enforce officially adopted policies creates the impression that compliance is not a high priority for managers and supervisors.

While all of the noted rationalizations apply to emergency response, they often carry over to nonemergency situations. Firefighters may easily develop the attitude that if it is acceptable to ride to an emergency without a seat belt, then there is no need to wear a seat belt when returning from the emergency or when riding in a fire and emergency service organization vehicle for any other reason.

One key factor appears to be the priority that is directed toward seat belt use by the fire chief and senior level officers of the fire and emergency service organization. A strong policy statement accompanied by a serious enforcement policy is usually effective in achieving a high level of compliance. In larger organizations, the policy must be enforced at each successive level of supervision down to the individual firefighter.

Where there are valid technical issues, such as problems with the design and installation of seat belts, management must be prepared to address those problems as part of the overall strategy. Members cannot be expected to work with equipment that does not perform the required function.

## Recruiting

An important point made by Hofstede (2000) is that one way to change the culture of a uniformed organization, such as the fire and emergency service, is to recruit more members with values that are different or independent from the organization. Soeters and Boer (2000) found this to be the case to help reduce military aircraft accidents. By incorporating more civilians and fewer people who had been indoctrinated into the military value system, a cultural shift toward a safer work environment ensued, and the number of aircraft accidents was reduced.

The same factors tend to influence individuals to become firefighters, both career and volunteer. The fire and emergency service is often viewed as an attractive outlet for individuals who are seeking opportunities to face extreme challenges and imminent danger. The recognition that is often associated with heroic actions is further motivation for many individuals to become involved in the fire and emergency service. The strongest, bravest and most daring individuals are often motivated to become firefighters.

The whole notion of daring and death defiance is continually applied to the fire and emergency service from external sources. The public tends to view firefighters as individuals who are willing to face extreme risks in order to save lives and property. These public perceptions are naturally incorporated into the firefighters' self-image and tend to further promote risky behaviors.

The media portrayal of fire and emergency service workers is generally not realistic, and it does not represent a true slice of what the work of the fire and emergency service is. Protective clothing may be altered or not used to show an actor's face or demonstrate a level of aggression or risk that is unreasonable in a real-world setting. This image is further reinforced by slogans such as "No Fear" and "Are You Tough Enough to Be a Hero?" as well as graphics portraying firefighters as dragon slayers and warriors facing overwhelming threats with nothing more than courage and daring. Peer pressure and competition often entice a "more daring" spirit than other individuals, companies, or fire and emergency service organizations. In some cases, actions that demonstrate appropriate caution are viewed as cowardly or impossible.

The warrior image is increasingly used to promote a sense of preparedness to engage in actions that require high levels of training and involve extreme physical challenges. These concepts are not inconsistent with the values of a strong safety culture. In many cases, the warrior image is presented in a context that appears to label the safety movement as a cowardly approach, expressing the notion that warriors are not concerned with safety because they are able to overcome any adversity.

## Environmental Factors

It has been observed that the current fire and emergency service generation has been raised in an environment that glorifies risk and expresses little or no concern for the potential negative consequences of bad decisions. The Internet along with tremendous expansion in the use of social media outlets, such as Facebook, Twitter and Instagram, and the influence of national fire service websites provide a continual supply of video clips and photos showing individuals risking life and limb in the pursuit of thrills and recognition. While many of these efforts result in obvious injuries, the consequences of such misadventures are never included in the video that is posted. There is an aura that even anonymous recognition for extreme daring is sufficient justification to accept the consequences of failure. Additionally, newer members who are accustomed to playing video games that allow individuals to experience simulated confrontation with every conceivable danger, with absolutely no risk of death or injury to the thrill seeker, may contribute to a lack of understanding of real-life consequences of high-risk behaviors.

## *Summary*

The culture of the American fire and emergency service community is rich and time-honored. The culture has aspects that provide superior protection for life and property, while it also has portions that contribute unnecessarily to firefighter and emergency worker injury and death. The culture can be changed at national, state and local levels without diminishing the quality of services provided by enhancing firefighter competencies needed at emergency scenes. Both the culture and climate can be moved toward a common sense, safety-oriented approach to balance the risks and rewards of questionable behaviors better.

This report generates important ideas that can be implemented to address culture and climate in an effort to change behavior in the American fire and emergency service community, which will lead to fewer injuries and deaths.

This document provides a foundation for future work in this area that will involve developing enhanced online educational materials and outreach. fire and emergency service organizations and individual responders can begin to engage in this move toward positive cultural change by visiting www.ffsafetyculture.org.

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FA-342/April 2015

# Texas Commission on Fire Protection

# Injury Report

## January 1, 2015 to December 31, 2015

# Table of Contents

# Executive Summary

This report includes the abstract, mission, reports, information and data collected by the Texas Commission on Fire Protection's injury reporting program. The report includes fire fighter injuries reported to the Texas Commission on Fire Protection in 2015, with charts and graphs depicting the collected information. The report also compares Texas fire fighter injury statistics with statistics gathered by the National Fire Protection Association (NFPA) in 2014.

Under Texas Government Code §419.048, the Texas Commission on Fire Protection is charged with developing and establishing criteria to receive and analyze injury information pertaining to Texas fire fighters. The commission reviews this information to develop recommendations to help reduce fire protection personnel injuries. The commission provides this information to the State Fire Marshal's Office (SFMO) by September 1 of each year for inclusion in the SFMO's annual Firefighter Fatality Investigations Report. The commission has enacted rules about reporting injuries in the Texas Administrative Code (TAC) Title 37, Chapter 435, and has established the criteria and policies for reporting and analyzing the information.

The commission built the data systems necessary to gather this information in 2010. Development is ongoing as we receive feedback from stakeholders on the efficiency of the system. The reporting process is accomplished online. Fire departments regulated by the commission have been notified of the requirement to report. Several volunteer departments, which are not regulated by the commission, are also participating voluntarily.

This report concludes with recommendations from the commission to help reduce the number of fire fighter injuries in Texas and to improve the injury reporting program.

# Abstract

Texas fire departments reported 3,721 injuries to the Texas Commission on Fire Protection in calendar year 2015. Of these, 783 occurred during fire suppression activities, representing 21 percent of the total reported injuries. This represents a 3.5 percent decrease in the ratio of fire suppression injuries to the total, which in 2014 accounted for 24.5 percent of injuries.

As in previous years, the largest number of reported injuries occurred during the performance of emergency medical services (EMS) activities: 979 of the 3,721 total reported injuries, or 26.3 percent. This represents the same ratio of EMS injuries to total injuries in 2014, in which 1,065 of 4,055 total injuries, or 26.2 percent, occurred during EMS activities. 160 of the 783 fire suppression injuries were serious (20 percent), and 185 of the 979 EMS injuries were serious (19 percent). (Note: The commission defines a serious injury as one that results in missed work.)

After EMS and fire suppression, the next highest number of injuries reported in 2015 occurred in the performance of station duties, with 573, or 15.4 percent, of the total injuries. This is nearly the same as in 2014, when 631, or 15.5 percent, of the total reported injuries occurred in the station.

Wellness/fitness activities and skills training again rounded out the top five activities resulting in injuries, with 417 (11.2 percent) and 405 (10.9 percent), respectively.

The total number of injuries reported in station duties, skills training, and wellness/fitness activities (which are all non-emergency activities) represented over a third (39 percent) of the total injuries. This represents a slight increase in the ratio of non-emergency to emergency activities; in 2014, 36 percent of injuries occurred during non-emergency activities.

# Mission

*The commission shall gather and evaluate data on fire protection personnel injuries and develop recommendations for reducing injuries.*

The commission's educational and outreach programs provide information on the various educational resources available through TCFP's Ernest A. Emerson Fire Protection Resource Library, associated references linked to this subject, TCFP outreach programs and the adoption of the "Courage to be Safe" and Federal Highway Administration Traffic Incident Management Program programs.

***Building a community of safety***

The goal of the Texas Commission on Fire Protection's injury reporting program is to help the fire service community identify common injuries and learn how to avoid risk and prevent injuries.

***Why we are collecting injury data***

Under Texas Government Code §419.048, the Texas Legislature charged the commission with gathering and evaluating data on injuries. The rules requiring regulated entities to report injuries to the commission are in Texas Administrative Code §435.23. The commission encourages volunteer entities to report injuries so that it can gain as accurate a picture as possible concerning injury trends in the Texas fire service. The injury reporting program began in March 2010.

***Information the commission collects***

- Minor, serious, critical and fatal injuries
- Activities where fire personnel are injured
- Types of injuries (burns, strain-sprains, wounds, etc.)
- Body parts being injured
- Tasks performed at the time of injury
- Missed time
- Work assignment after injury
- Malfunctions/failures of personal protective equipment (PPE), self-contained breathing apparatus (SCBA), personal alert safety systems (PASS devices) and standard operating procedures (SOPs)

***How this will help the fire service***

- Identify common injuries
- Identify trends in injuries
- Identify needed training
- Evaluate and find improvements in procedures
- Track lost time injuries (requested by user community)

## Reports, Information and Data Collection

This report contains data submitted by regulated and non-regulated entities. The data collected in 2015 was the fifth full year of reporting.

Of the approximately 567 commission-regulated fire departments included in this report, 523, or 92 percent, either submitted an injury report or a "no injury" report for months in which their personnel did not have any injuries. (An additional 103 regulated entities that are not fire departments, however, did not report. The agency will continue to reach out to all regulated entities to communicate the need to report and the types of information needed.) The commission stresses the need for participation and provides reminders to regulated entities of the statutory requirement to report.

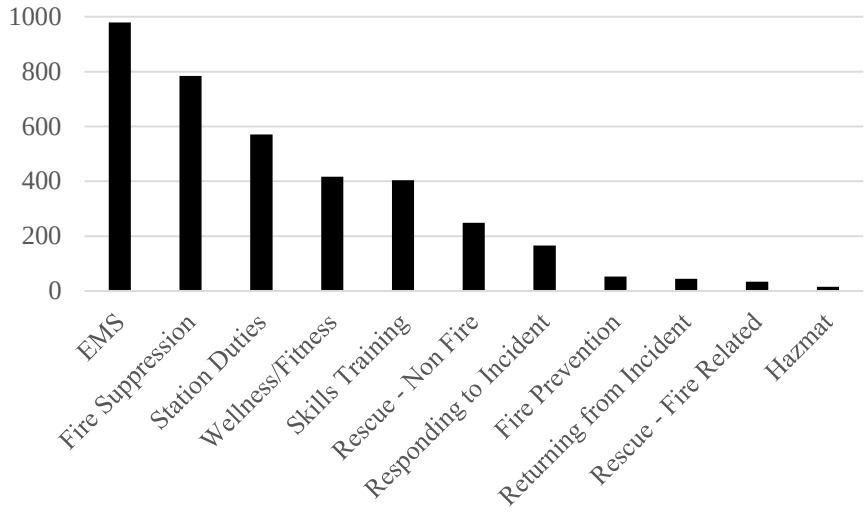
As in previous years, the commission continues to receive feedback from stakeholders on challenges they have experienced and changes they would like to see in the injury reporting program.

# Fire Protection Personnel Injuries

***Table 1: Injuries by Activity and Severity, 2015***

| Activity | Minor | Serious | Critical | Fatal | Total |
|---|---|---|---|---|---|
| EMS | 792 | 185 | 1 | 1 | 979 |
| Fire Suppression | 618 | 160 | 4 | 1 | 783 |
| Station Duties | 396 | 174 | 2 | 1 | 573 |
| Wellness/Fitness | 288 | 125 | 4 | | 417 |
| Skills Training | 278 | 126 | 1 | | 405 |
| Rescue - Non Fire | 204 | 46 | | | 250 |
| Responding to Incident | 122 | 44 | | | 166 |
| Fire Prevention | 41 | 12 | | | 53 |
| Returning from Incident | 33 | 13 | | | 46 |
| Rescue - Fire Related | 22 | 12 | | | 34 |
| Hazmat | 11 | 4 | | | 15 |
| **Total** | **2804** | **898** | **12** | **3** | **3721** |

***Figure 1: Total Injuries by Activity, 2015***



# Minor and Serious Injuries by Activity

EMS activities resulted in the highest number of both minor and serious injuries this year. In 2014, fire suppression activities resulted in the highest number of serious injuries, but in 2015 there were more serious injuries in EMS and station duties than in fire suppression. We note that there has been a steady decline in serious fire suppression injuries in the past four years. (See Table 3. The commission defines a serious injury as one which results in the employee missing one or more full duty shifts.)

***Table 2: Minor Injury Activities, 2012 - 2015***

| | 2012 | | 2013 | | 2014 | | 2015 | |
|---|---|---|---|---|---|---|---|---|
| **Activity** | **Count** | **Percent** | **Count** | **Percent** | **Count** | **Percent** | **Count** | **Percent** |
| EMS | 1042 | 32.41% | 934 | 30.28% | 900 | 28.03% | 792 | 28.25% |
| Fire Suppression | 654 | 20.43% | 619 | 20.06% | 808 | 25.16% | 618 | 22.04% |
| Station Duties | 508 | 15.80% | 452 | 14.65% | 465 | 14.48% | 396 | 14.12% |
| Skills Training | 367 | 11.42% | 317 | 10.28% | 365 | 11.37% | 288 | 10.27% |
| Wellness/Fitness | 294 | 9.14% | 285 | 9.24% | 254 | 7.91% | 278 | 9.88% |
| Rescue - Non Fire | 147 | 4.57% | 243 | 7.88% | 206 | 6.42% | 204 | 7.28% |
| Responding to Incident | 90 | 2.80% | 70 | 2.27% | 105 | 3.27% | 122 | 4.35% |
| Fire Prevention | 45 | 1.40% | 66 | 2.14% | 43 | 1.34% | 41 | 1.46% |
| Returning from Incident | 30 | 0.93% | 37 | 1.20% | 42 | 1.31% | 33 | 1.18% |
| Rescue - Fire Related | 14 | 0.44% | 18 | 0.58% | 11 | 0.34% | 22 | 0.78% |
| Hazmat | 24 | 0.75% | 44 | 1.43% | 12 | 0.37% | 11 | 0.39% |
| **Total** | **3215** | **100.00%** | **3085** | **100.00%** | **3211** | **100.00%** | **2805** | **100.00%** |

***Table 3: Serious Injury Activities, 2012 - 2015***

| | 2012 | | 2013 | | 2014 | | 2015 | |
|---|---|---|---|---|---|---|---|---|
| **Activity** | **Count** | **Percent** | **Count** | **Percent** | **Count** | **Percent** | **Count** | **Percent** |
| EMS | 196 | 18.97% | 179 | 19.02% | 164 | 19.90% | 185 | 20.60% |
| Station Duties | 233 | 22.56% | 201 | 21.36% | 160 | 19.42% | 174 | 19.27% |
| Fire Suppression | 231 | 22.36% | 206 | 21.89% | 177 | 21.48% | 160 | 17.82% |
| Skills Training | 113 | 10.94% | 99 | 10.52% | 104 | 12.62% | 126 | 13.92% |
| Wellness/Fitness | 134 | 12.97% | 122 | 12.96% | 127 | 15.41% | 125 | 14.03% |
| Rescue - Non Fire | 34 | 3.29% | 46 | 4.89% | 38 | 4.61% | 46 | 5.01% |
| Responding to Incident | 43 | 4.16% | 42 | 4.46% | 16 | 1.94% | 44 | 4.90% |
| Returning from Incident | 24 | 2.32% | 18 | 1.91% | 19 | 2.31% | 13 | 1.34% |
| Fire Prevention | 18 | 1.74% | 17 | 1.81% | 11 | 1.33% | 12 | 1.34% |
| Rescue - Fire Related | 7 | 0.68% | 11 | 1.17% | 3 | 0.36% | 12 | 1.34% |
| Hazmat | 0 | 0 | 0 | 0 | 5 | 0.61% | 4 | 0.45% |
| **Total** | **1033** | **100.00%** | **941** | **100.00%** | **824** | **100.00%** | **901** | **100.00%** |

# Emergency vs. Non-Emergency Injuries

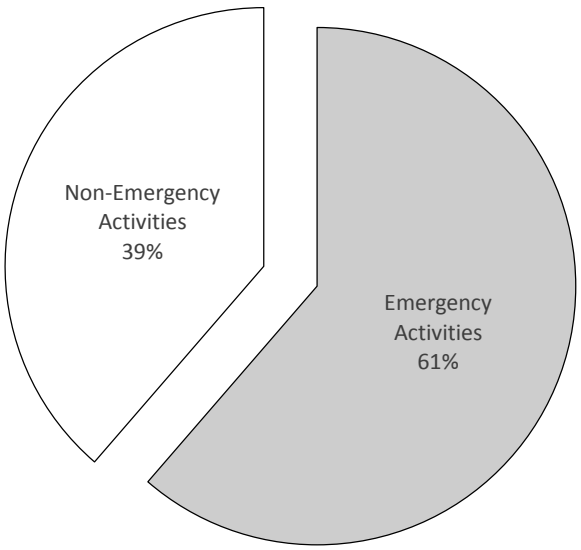
***Table 4: Injuries by Emergency Activity and Severity, 2015***

| Activity | Minor | Serious | Critical | Fatal | Total |
|---|---|---|---|---|---|
| EMS | 792 | 185 | 1 | 1 | 979 |
| Fire Suppression | 618 | 160 | 4 | 1 | 783 |
| Rescue - Non Fire | 204 | 46 | | | 250 |
| Responding to Incident | 122 | 44 | | | 166 |
| Returning from Incident | 33 | 13 | | | 46 |
| Rescue - Fire Related | 22 | 12 | | | 34 |
| Hazmat | 11 | 4 | | | 15 |
| **Total** | **1802** | **462** | **5** | **2** | **2273** |

***Table 5: Injuries by Non-Emergency Activity and Severity, 2015***

| Activity | Minor | Serious | Critical | Fatal | Total |
|---|---|---|---|---|---|
| Station Duties | 396 | 174 | 2 | 1 | 573 |
| Wellness/Fitness | 288 | 125 | 4 | | 417 |
| Skills Training | 278 | 126 | 1 | | 405 |
| Fire Prevention | 41 | 12 | | | 53 |
| **Total** | **1003** | **437** | **7** | **1** | **1448** |

***Figure 2: Percent of Total Injuries in Emergency and Non-Emergency Activities, 2015***

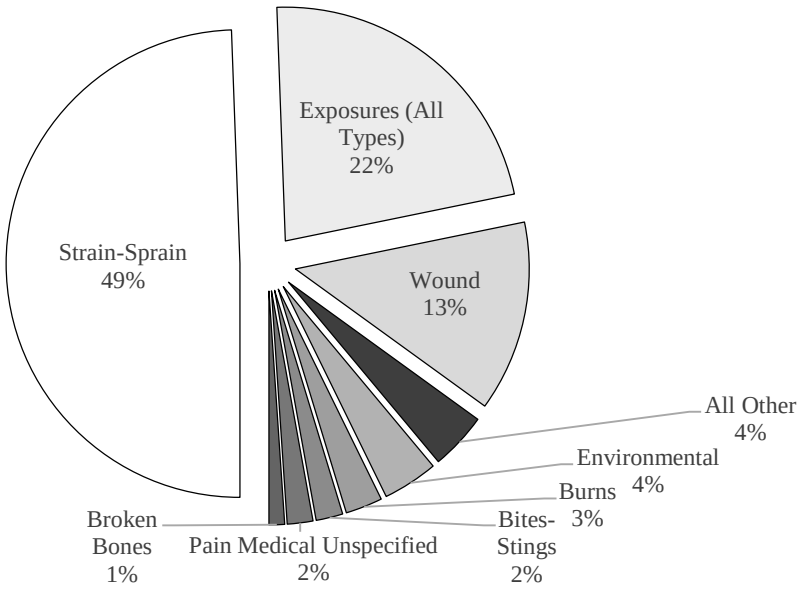


# Injuries by Type

***Table 6: Types of Injury, 2012-2015*** *(Note: ordered by 2015, descending)*

| | 2012 | | 2013 | | 2014 | | 2015 | |
|---|---|---|---|---|---|---|---|---|
| **Type of Injury** | **Count** | **Percent** | **Count** | **Percent** | **Count** | **Percent** | **Count** | **Percent** |
| Strain-Sprain | 2140 | 50.19% | 2118 | 52.30% | 1917 | 47.27% | 1839 | 49.42% |
| Wound | 631 | 14.80% | 548 | 13.53% | 483 | 11.91% | 491 | 13.20% |
| Exposure-Undetermined | 23 | 0.54% | 77 | 1.90% | 120 | 2.96% | 287 | 7.71% |
| Exposure Blood Pathogens | 160 | 3.75% | 164 | 4.05% | 183 | 4.51% | 181 | 4.86% |
| Exposure - Body Fluids | 124 | 2.91% | 138 | 3.41% | 109 | 2.69% | 167 | 4.49% |
| Environmental | 133 | 3.12% | 106 | 2.62% | 101 | 2.49% | 142 | 3.82% |
| Exposure Airborne Pathogens | 404 | 9.47% | 281 | 6.94% | 369 | 9.10% | 141 | 3.79% |
| Burns | 176 | 4.13% | 166 | 4.07% | 113 | 2.79% | 95 | 2.55% |
| Bites-Stings | 93 | 2.18% | 87 | 2.15% | 79 | 1.95% | 69 | 1.85% |
| Pain Medical Unspecified | 49 | 1.15% | 62 | 1.53% | 79 | 1.95% | 66 | 1.77% |
| Exposure-Chemical | 128 | 3.00% | 90 | 2.22% | 313 | 7.72% | 53 | 1.42% |
| Broken Bones | 46 | 1.08% | 59 | 1.46% | 39 | 0.96% | 40 | 1.07% |
| Chest Pains-Cardiac | 40 | 0.94% | 50 | 1.23% | 46 | 1.13% | 37 | 0.99% |
| Smoke-Gas Inhalation | 22 | 0.52% | 30 | 0.74% | 20 | 0.49% | 35 | 0.94% |
| Debris/Penetrating | 51 | 1.20% | 38 | 0.94% | 38 | 0.94% | 34 | 0.91% |
| Hearing Loss - Acute | 18 | 0.42% | 14 | 0.35% | 21 | 0.52% | 19 | 0.51% |
| Electrocution | 11 | 0.26% | 12 | 0.30% | 12 | 0.30% | 9 | 0.24% |
| Hearing Loss - Chronic | 7 | 0.16% | 2 | 0.05% | 4 | 0.10% | 7 | 0.19% |
| Exposure-Chemical-CO | 1 | 0.02% | 6 | 0.15% | 3 | 0.07% | 3 | 0.08% |
| Heart Attack | 2 | 0.05% | 2 | 0.05% | 1 | 0.02% | 3 | 0.08% |
| Broken Spine-Neck | 4 | 0.09% | 1 | 0.02% | 4 | 0.10% | 2 | 0.05% |
| Smoke Inhalation | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 1 | 0.03% |
| Stroke | 1 | 0.02% | 0 | 0.00% | 1 | 0.02% | 0 | 0.00% |
| **Total** | **4264** | **100.00%** | **4051** | **100.00%** | **4055** | **100.00%** | **3721** | **100.00%** |

***Figure 3: Types of Injury, 2015***



# Task at Time of Injury

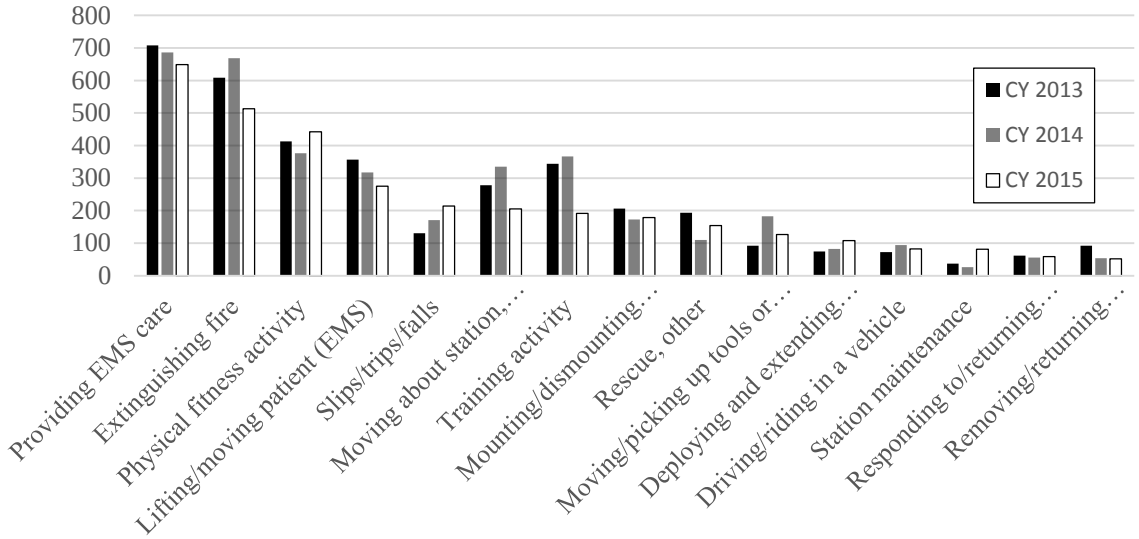
(The commission began gathering task information in mid-2012.)

***Table 7: Top 15 Tasks at Time of Injury, 2013-2015*** *(ordered by 2015, descending)*

| Task | 2013 | 2014 | 2015 |
|---|---|---|---|
| Providing EMS care | 708 | 686 | 649 |
| Extinguishing fire or neutralizing incident | 609 | 669 | 513 |
| Physical fitness activity | 413 | 376 | 442 |
| Lifting/moving patient (EMS) | 357 | 317 | 275 |
| Slips/trips/falls | 131 | 171 | 215 |
| Moving about station, normal activity | 278 | 335 | 206 |
| Training activity | 344 | 367 | 193 |
| Mounting/dismounting apparatus | 206 | 173 | 180 |
| Rescue, other | 193 | 110 | 155 |
| Moving/picking up tools or equipment | 92 | 183 | 128 |
| Deploying and extending hoseline | 74 | 82 | 108 |
| Driving/riding in a vehicle | 72 | 94 | 82 |
| Station maintenance | 37 | 26 | 81 |
| Responding to/returning from incident | 62 | 56 | 59 |
| Removing equipment from/returning equipment to apparatus | 92 | 54 | 52 |
| All other* | 383 | 356 | 383* |
| **Total** | **4051** | **4055** | **3721** |

* All other, 2015, in descending order: Overhaul (47), Vehicle maintenance (38), Operating manual tool (33), Ascending/descending stairs (31), Equipment maintenance (29), Extrication (28), Ascending/descending ladder (24), Forcible entry (23), Moving about station, alarm sounding (20), Other: description (17), Non-fire incidents (13), Operating power tool (13), Raising/lowering ladder (13), Inspection activity (10), Crawling in a confined or otherwise hazardous area (8), Manually moving item to gain access (6), Operating in low/no visibility (6), Unidentified (5), Carrying/dragging a person (rescue) (5), Incident Investigation (5), Administrative Work (4), Operating Fire Department Apparatus (2), Salvage (2), Operating nozzle (1)

***Figure 4: Top 15 Tasks at Time of Injury, 2013-2015***



# Injuries by Body Part

***Table 8: Injuries by Body Part, 2012 - 2015***

| Body Part | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|
| Multiple body parts, whole body | 760 | 595 | 901 | 659 |
| Knee | 419 | 407 | 367 | 369 |
| Hand and fingers | 453 | 403 | 345 | 328 |
| Hip, lower back, or buttocks | 35 | 91 | 244 | 316 |
| Shoulder | 272 | 293 | 230 | 241 |
| Back, except spine | 686 | 588 | 372 | 207 |
| Ankle | 213 | 207 | 177 | 202 |
| Multiple Parts | 5 | 62 | 160 | 180 |
| Face | 95 | 128 | 118 | 140 |
| Leg, lower | 105 | 108 | 86 | 117 |
| Arm, lower, not including elbow or wrist | 89 | 84 | 94 | 84 |
| Eye | 106 | 100 | 98 | 75 |
| Foot and toes | 132 | 105 | 79 | 71 |
| Head | 96 | 94 | 73 | 69 |
| Ear | 72 | 54 | 52 | 60 |
| Multiple body parts, upper body | 22 | 57 | 27 | 52 |
| Elbow | 98 | 68 | 66 | 51 |
| Other body parts injured | 357 | 381 | 265 | 500* |
| **Total** | **4264** | **4051** | **4055** | **3721** |

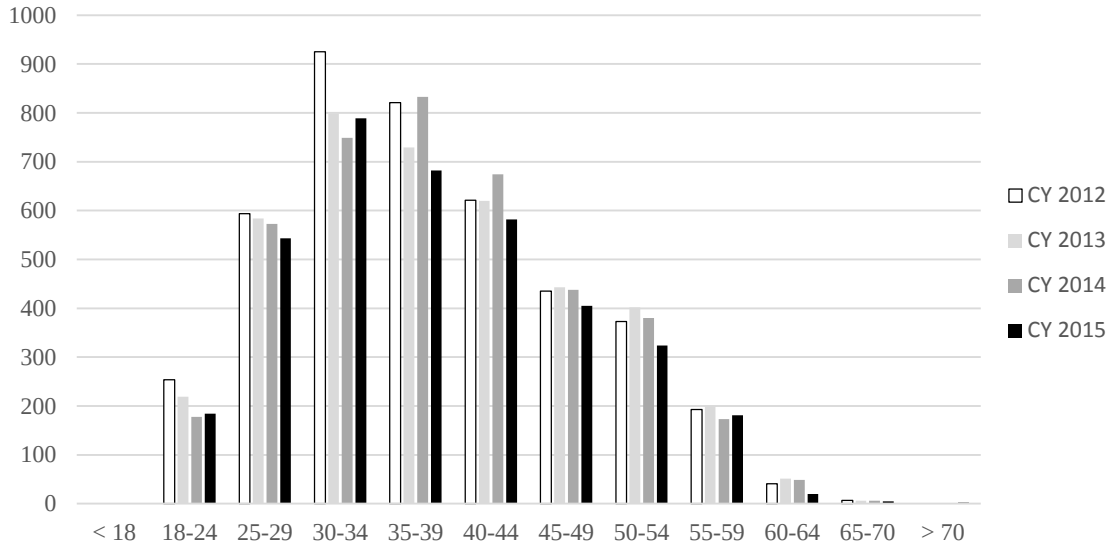
* ***Other body parts injured, 2015, in descending order:*** *Wrist (48), Upper extremities (46), Neck (45), Pelvis or groin (42), Chest (40), Abdomen (38), Lower Extremities (36), Trachea and lungs (33), Arm, upper, not including elbow or shoulder (31), Leg, upper (29), Mouth, included are lips, teeth, and interior (26), Neck and Shoulders (22), Heart (19), Multiple body parts, lower body (10), Abdominal area (7), Unidentified (5), Nose (5), Throat (5), Internal, other (3), Spine (3), Part of body, other (2), Undetermined (2), Head, other (1), Internal (1), Thorax (1)*

# Injuries by Age Group

***Table 9: Injuries by Age Group, 2012 - 2015***

| | 2012 | | 2013 | | 2014 | | 2015 | |
|---|---|---|---|---|---|---|---|---|
| **Age group** | **Count** | **Percent** | **Count** | **Percent** | **Count** | **Percent** | **Count** | **Percent** |
| < 18 | 0 | 0.00% | 0 | 0.00% | 1 | 0.02% | 0 | 0.00% |
| 18-24 | 254 | 5.96% | 219 | 5.41% | 178 | 4.39% | 187 | 5.03% |
| 25-29 | 594 | 13.93% | 584 | 14.42% | 573 | 14.13% | 543 | 14.59% |
| 30-34 | 925 | 21.69% | 799 | 19.73% | 749 | 18.47% | 791 | 21.26% |
| 35-39 | 821 | 19.25% | 729 | 18.00% | 833 | 20.54% | 682 | 18.33% |
| 40-44 | 621 | 14.56% | 620 | 15.31% | 674 | 16.62% | 582 | 15.64% |
| 45-49 | 435 | 10.20% | 443 | 10.94% | 438 | 10.80% | 405 | 10.88% |
| 50-54 | 373 | 8.75% | 402 | 9.90% | 380 | 9.37% | 323 | 8.68% |
| 55-59 | 193 | 4.53% | 198 | 4.89% | 173 | 4.27% | 181 | 4.86% |
| 60-64 | 41 | 0.96% | 51 | 1.26% | 49 | 1.21% | 20 | 0.54% |
| 65-70 | 7 | 0.16% | 6 | 0.15% | 6 | 0.15% | 5 | 0.13% |
| > 70 | 0 | 0.00% | 0 | 0.00% | 1 | 0.02% | 2 | 0.05% |
| **Totals** | **4264** | **100.00%** | **4051** | **100.00%** | **4055** | **100.00%** | **3721** | **100.00%** |

***Figure 5: Injury Count by Age Group, 2012 - 2015***



# Injury Activities Resulting in Lost Time

***Table 10: Injury Activities Resulting in Lost Time, 2015***

| | | Days Missed | |
|---|---|---|---|
| **Activity** | **Count** | **Average** | **Total** |
| EMS | 144 | 41 | 5973 |
| Station Duties | 136 | 34 | 4644 |
| Fire Suppression | 132 | 35 | 4592 |
| Wellness/Fitness | 105 | 37 | 3850 |
| Skills Training | 93 | 40 | 3694 |
| Rescue - Non Fire | 33 | 26 | 871 |
| Responding to Incident | 33 | 22 | 714 |
| Returning from Incident | 10 | 29 | 285 |
| Fire Prevention | 9 | 33 | 298 |
| Rescue - Fire Related | 7 | 9 | 65 |
| Hazmat | 3 | 22 | 67 |
| **Total** | **705** | **36** | **25053** |

***Table 11: Activities Resulting in Lost Time, 2015, between 1 and 30 Days***

| | | Days Missed | |
|---|---|---|---|
| **Activity** | **Count** | **Average** | **Total** |
| Fire Suppression | 101 | 10 | 1002 |
| Station Duties | 93 | 13 | 1169 |
| EMS | 86 | 12 | 1031 |
| Wellness/Fitness | 70 | 11 | 790 |
| Skills Training | 62 | 10 | 636 |
| Responding to Incident | 27 | 12 | 314 |
| Rescue - Non Fire | 26 | 14 | 356 |
| Rescue - Fire Related | 7 | 9 | 65 |
| Returning from Incident | 7 | 10 | 68 |
| Fire Prevention | 6 | 11 | 63 |
| Hazmat | 2 | 16 | 31 |
| **Total, Between 1 and 30 Days** | **487** | **11** | **5525** |

# Injury Activities Resulting in Lost Time (continued)

***Table 12: Activities Resulting in Lost Time, 2015, between 31 and 90 Days***

| | | Days Missed | |
|---|---|---|---|
| **Activity** | **Count** | **Average** | **Total** |
| EMS | 43 | 52 | 2248 |
| Station Duties | 29 | 53 | 1523 |
| Wellness/Fitness | 25 | 58 | 1442 |
| Skills Training | 18 | 56 | 999 |
| Fire Suppression | 15 | 57 | 857 |
| Rescue - Non Fire | 6 | 51 | 308 |
| Responding to Incident | 6 | 67 | 400 |
| Fire Prevention | 2 | 55 | 110 |
| Returning from Incident | 2 | 52 | 103 |
| Hazmat | 1 | 36 | 36 |
| **Total, Between 31 and 90 Days** | **147** | **55** | **8026** |

***Table 13: Activities Resulting in Lost Time, 2015, 91+ Days***

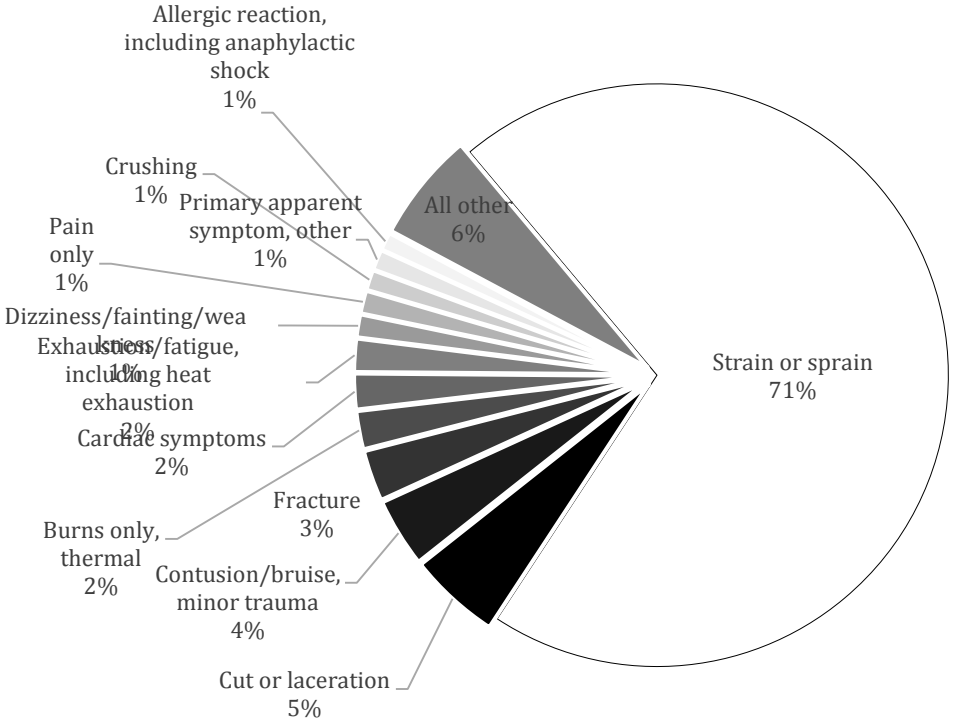
| | | Days Missed | |
|---|---|---|---|
| **Activity** | **Count** | **Average** | **Total** |
| Fire Suppression | 16 | 171 | 2733 |
| EMS | 15 | 180 | 2694 |
| Station Duties | 14 | 139 | 1952 |
| Skills Training | 13 | 158 | 2059 |
| Wellness/Fitness | 10 | 162 | 1618 |
| Fire Prevention | 1 | 125 | 125 |
| Rescue - Non Fire | 1 | 207 | 207 |
| Returning from Incident | 1 | 114 | 114 |
| **Total, 91+ Days Missed** | **71** | **162** | **11502** |

# Types of Injuries with Lost Time

***Table 14: Types of Injuries Resulting in Lost Time, 2015***

| Type of Injury | Count | Average Days Out |
|---|---|---|
| Strain or sprain | 496 | 41 |
| Cut or laceration | 36 | 9 |
| Contusion/bruise, minor trauma | 27 | 21 |
| Fracture | 20 | 70 |
| Burns only, thermal | 15 | 15 |
| Cardiac symptoms | 14 | 17 |
| Exhaustion/fatigue, including heat exhaustion | 13 | 6 |
| Dizziness/fainting/weakness | 9 | 9 |
| Pain only | 9 | 16 |
| Crushing | 8 | 22 |
| Primary apparent symptom, other | 8 | 57 |
| Allergic reaction, including anaphylactic shock | 7 | 9 |
| All other | 43 | 17 |
| **Total** | **705** | **36** |

***Figure 6: Types of Injuries Resulting in Lost Time, 2015***



# Burn Injuries

***Table 15: All Burns, 2013 - 2015***

| All Burns - Types | 2013 | 2014 | 2015 |
|---|---|---|---|
| Thermal | 92 | 76 | 85 |
| Scald or steam | 71 | 33 | 10 |
| Chemical | 0 | 2 | 0 |
| Electric | 2 | 2 | 0 |
| **Total** | **165** | **113** | **95** |

***Table 16: Burns with Lost Time by Burn Type, 2015***

| Burns with Lost Time | Count | Average Days Missed | Total Days Missed |
|---|---|---|---|
| Thermal | 15 | 15 | 226 |
| Scald or steam | 3 | 10 | 30 |
| **Total** | **18** | **14** | **256** |

***Table 17: Burns by Body Part, 2013 - 2015***

| Body Part | 2013 | 2014 | 2015 |
|---|---|---|---|
| Ear | 29 | 13 | 22 |
| Hand and fingers | 35 | 18 | 14 |
| Face | 14 | 13 | 12 |
| Multiple parts | 16 | 16 | 8 |
| Neck | 9 | 9 | 6 |
| Leg, lower | 4 | 1 | 6 |
| Shoulder | 13 | 5 | 5 |
| Multiple body parts, upper body | 3 | 4 | 5 |
| Wrist | 10 | 5 | 4 |
| Head | 5 | 3 | 4 |
| Arm, lower, not including elbow or wrist | 12 | 9 | 3 |
| Upper extremities | 0 | 6 | 2 |
| Arm, upper, not including elbow or shoulder | 1 | 2 | 2 |
| Foot and toes | 5 | 2 | 1 |
| Lower extremities | 5 | 2 | 1 |
| Back, except spine | 0 | 2 | 0 |
| Hip, lower back or buttocks | 0 | 1 | 0 |
| Eye | 0 | 1 | 0 |
| Neck and shoulders | 1 | 1 | 0 |
| Chest | 1 | 0 | 0 |
| Elbow | 1 | 0 | 0 |
| Knee | 1 | 0 | 0 |
| Throat | 1 | 0 | 0 |
| **Total** | **166** | **113** | **95** |

# Burn Injuries (continued)

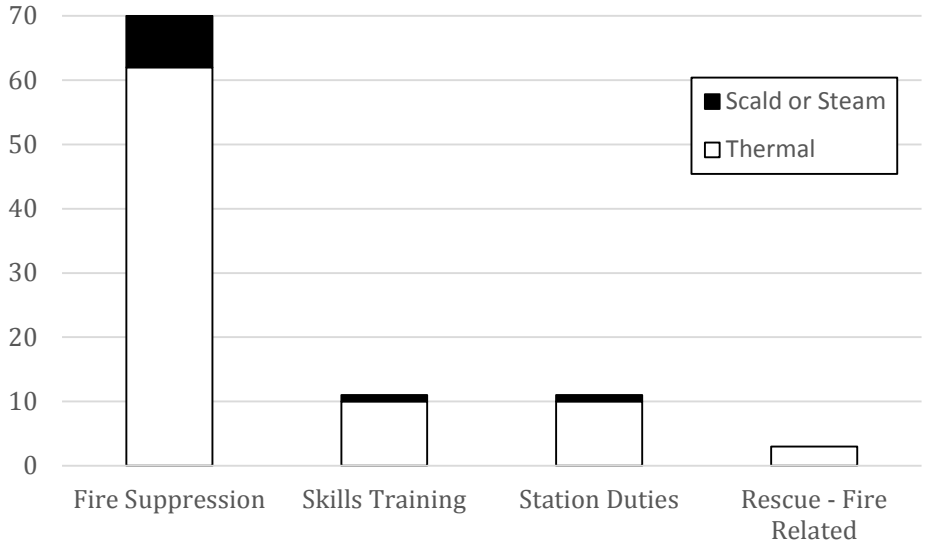
***Table 18: Burns by Emergency Activity, 2015***

| | Emergency Activities | |
|---|---|---|
| **Type** | **Fire Suppression** | **Rescue-Fire Related** |
| Thermal | 62 | 3 |
| Scald or Steam | 8 | |
| **Total** | **70** | **3** |

***Table 19: Burns by Non-Emergency Activity, 2015***

| | Non-Emergency Activities | |
|---|---|---|
| **Type** | **Skills Training** | **Station Duties** |
| Thermal | 10 | 10 |
| Scald or Steam | 1 | 1 |
| **Total** | **11** | **11** |

***Figure 7: Burns by Activity, 2015***



# Exposures

Agency staff has proposed modifying the commission's injury report form to include separate, specific categories of exposure/illness reporting:

- Exposure with injury
- Exposure with no injury
- Illness

The staff has been working to incorporate these categories into a redesigned injury report form; we hope to begin using the new data entry form at the beginning of the 2017 reporting year.

Fire protection personnel are routinely exposed to a variety of harmful agents. We currently categorize exposures primarily by "types" that illustrate the routes of exposure, including airborne pathogens, blood pathogens, body fluids, chemicals, plant toxins and undetermined. We have found, however, that these types often overlap or are not easily distinguishable. An example would be when a group of first responders provide care to a vehicle accident victim who is later discovered to have meningitis: meningitis can be bacterial, fungal, viral, parasitic, or systemic, and the department may not be able to determine immediately whether the greatest risk in providing care resulted from exposure to airborne droplets (from sneezing or coughing, for example), or from direct/dermal contact with the patient's body fluids or blood. Another common example would be a team of fire fighters exposed at a fire incident to potentially toxic smoke; it can be difficult for departments to determine whether to report the exposures as airborne pathogens, chemicals, etc., especially if the toxic agent is unknown.

In reviewing exposure reports, however, the staff has found that exposure agents can be grouped in a manger that may better characterize the hazards to which fire fighters are exposed. This "re-grouping" was based primarily on the types of agents, rather than on the routes of exposure. In the following pages these "groups" are broken down into biological agents, chemical/mineral agents, animals/wildlife, poison plants and undetermined. We have also included several additional "types" in this analysis to better capture potential exposures; as an example, we reviewed all the injuries entered as "wounds" and found 21 injuries which could have been categorized either as wounds or as exposures. (These were primarily puncture wounds from nails, lancets and needles.)

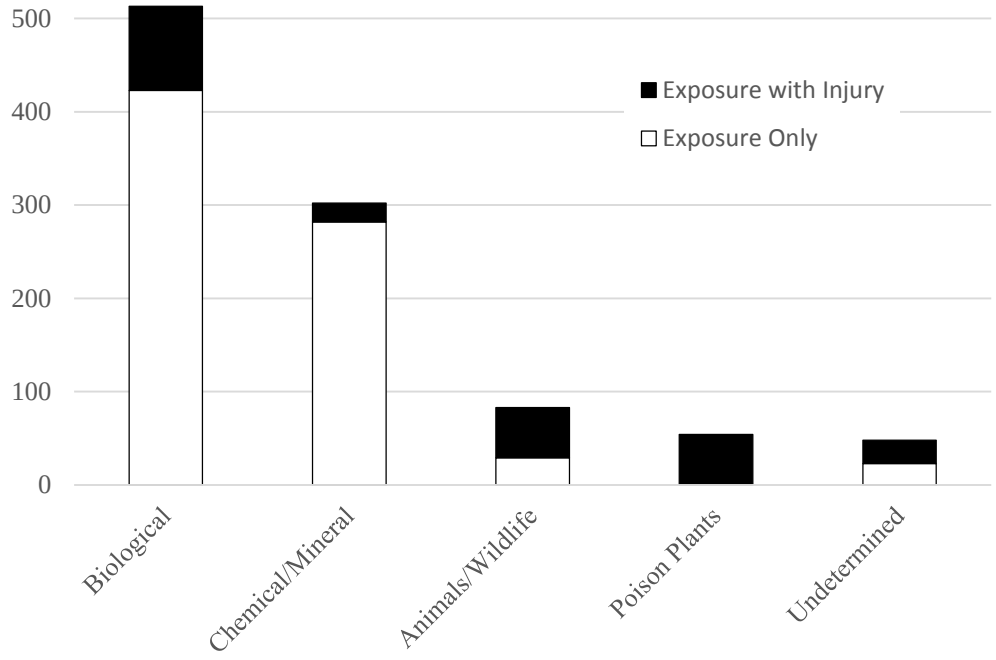
In 2015, the agency received 837 reports from fire departments in the report form's current exposure categories (see Table 6, Types of Injuries). In our review, we found 163 other injuries that could also have been reported as exposures, from the categories of wounds, smoke/gas inhalation, bites/stings, and environmental injuries, bringing the total to 1,000 exposures. Staff has further evaluated these reports to determine whether an injury resulted from or in conjunction with the exposure.

# Exposures (continued)

***Table 20: Exposures by "Group," With and Without Injury, 2015***

| Group | Exposure Only | Exposure with Injury | Total |
|---|---|---|---|
| Biological | 423 | 90 | 513 |
| Chemical/Mineral | 282 | 20 | 302 |
| Animals/Wildlife | 29 | 54 | 83 |
| Poison Plants | 0 | 54 | 54 |
| Undetermined | 23 | 25 | 48 |
| **Grand Total** | **757** | **243** | **1000** |

***Figure 8: Exposures by "Group," With and Without Injury, 2015***



# Exposures (continued)

***Table 21: Exposures by "Group" and Agent, 2015***

| Group/Agent | Count |
|---|---|
| **Chemical/Mineral** | |
| Smoke | 161 |
| Asbestos | 50 |
| Water | 41 |
| Marijuana Smoke | 12 |
| Carbon monoxide | 8 |
| Insecticide | 7 |
| Diesel fuel | 6 |
| Chlorine gas | 4 |
| Calcium carbide/acetylene | 2 |
| Undetermined | 1 |
| Abrasive compound | 1 |
| Battery acide | 1 |
| Gasoline | 1 |
| Hydraulic fluid | 1 |
| Hydrogen sulfide | 1 |
| Lacquer thinner | 1 |
| Micro-Blaze | 1 |
| Natural gas | 1 |
| Novec 1230 | 1 |
| **Total, Chemical/Mineral** | **302** |

| Group/Agent | Count |
|---|---|
| **Animals/Wildlife** | |
| Bed Bugs | 186 |
| Dog | 105 |
| Spider | 87 |
| Scabies | 73 |
| Wasp | 9 |
| Cat | 9 |
| Bee | 8 |
| Insect, unidentified | 5 |
| Ants | 4 |
| Bees | 4 |
| **Total, Animals/Wildlife** | **833** |

| Group/Agent | Count |
|---|---|
| **Poison Plants** | |
| Poison ivy | 49 |
| Poison ivy/poison oak | 3 |
| Poison oak | 1 |
| Undetermined | 1 |
| **Total, Poison Plants** | **53** |

| Group/Agent | Count |
|---|---|
| **Biological** | |
| Blood | 186 |
| Body Fluids | 105 |
| Meningitis | 87 |
| TB | 73 |
| Hepatitis C | 9 |
| Tetanus | 9 |
| Undetermined | 8 |
| HIV and Hepatitis | 5 |
| C-Diff | 4 |
| Hepatitis C and C-Diff | 4 |
| Mold | 4 |
| Staph | 4 |
| Adenovirus | 3 |
| Herpes | 2 |
| HIV | 2 |
| HIV and TB | 2 |
| Meningitis or encephalitis | 2 |
| TB and meningitis | 2 |
| Meningitis and pneumonia | 1 |
| Pneumonia | 1 |
| **Total, Biological** | **513** |

| Group/Agent | Count |
|---|---|
| **Undetermined** | |
| Undetermined | 40 |
| Unidentified carcinogen | 8 |
| **Total, Undetermined** | **48** |

| | |
|---|---|
| **Grand Total** | **1000** |

## Cancer reports

The commission received 14 reports of cancer diagnoses from fire departments in 2015. The commission encourage departments to report these illnesses to help the Texas fire service gain a better understanding of long-term illnesses from which fire protection personnel are suffering:

Male, 58

*Long-term exposure to carcinogens*

Male, 48

*Occupational illness due to unknown exposure. It is known that he is a cancer patient.*

Male, 32

*Employee developed a cancer growth. The squamous cell carcinoma is on the back of his head where the ratchet is to tighten his helmet.*

Male, 59

*Report of injury for informational purposes only of a recent diagnosis of prostate cancer.*

Male, 59

*Firefighter was ill and was diagnosed with colon cancer. He has been a firefighter for 29 years.*

Male, 51

*Firefighter was treated for basal cell carcinoma skin cancers.*

Male, 57

*Firefighter was recently diagnosed with B-cell Non-Hodgkin's Lymphoma.*

Male, 51

*Diagnosed with squamous cell carcinoma on left cheek where mask and hood contact face.*

Male 34

*Firefighter has been diagnosed and treated periodically with melanoma, basal cell carcinoma, and cytologic atypia.*

Male, 50

*This individual has been diagnosed with cancer.*

Male, 56

*Individual has been diagnosed with cancer.*

Male, 46

*Employee is suffering from T-cell lymphoma due to prolonged exposure to carcinogens. Cancer spread to the spleen, skeletal system, liver and lungs.*

Male, 42

*Invasive ductal carcinoma diagnosed in left breast.*

Male, 35

*The firefighter reported to his Captain on this date that he had testicular cancer.*

## SOP Issues

In 2015 there were 33 injuries attributed to failures of fire protection personnel to follow their departments' standard operating procedures (SOPs). All but a few were instances where the individuals were not wearing their provided PPE/SCBA gear in an environment or situation in which they should have been.

In its compliance inspections, the Texas Commission on Fire Protection verifies that fire departments have written SOPs that cover the appropriate subject matter.

***Table 22: Injuries Attributed to SOP Issues, 2015***

| Activity | Minor | Serious | Total |
|---|---|---|---|
| EMS | 10 | 2 | 12 |
| Fire Suppression | 3 | 3 | 6 |
| Rescue - Non Fire | 5 | 1 | 6 |
| Station Duties | 0 | 4 | 4 |
| Wellness/Fitness | 1 | 2 | 3 |
| Responding to Incident | 1 | 0 | 1 |
| Skills Training | 0 | 1 | 1 |
| **Total** | **21** | **12** | **33** |

## Fatalities

The commission's 2015 injury report includes three fatalities. The fatalities listed in this report include only those reported to the Texas Commission on Fire Protection (TCFP) by the entities it regulates. (The commission has no statutory authority to require reporting by departments it does not regulate.)

More comprehensive information regarding Texas fire service Line of Duty Deaths is included in the State Fire Marshal's Annual Report.

# Example Injury Narratives

### Burn injuries

The body part most frequently burned on the fireground in 2015 were ears; five of these injuries resulted in lost time. These narratives illustrate scenarios in which fire fighters suffered burns to the ears:

Fire suppression – minor - ear
*During a response to a house fire, while fighting fire inside the house, the firefighter suffered a second degree burn to his right ear. After interviewing the firefighter, it was discovered that his protective hood was accidently pushed back while donning his helmet and SCBA mask, thereby exposing the right ear.*

Fire suppression – minor- ear
*Firefighter made entry. Approximately 10 feet into the structure firefighter began retreating due to intense heat. Firefighter's ears were blistered.*

Fire suppression – serious - ear
*While working a structure fire, the individual was on the initial entry team with his Captain. He made his way to the rear of the mobile home with 1.5-inch charged hose line while wearing full PPE. He was told by his Captain that it was getting hot so he began cooling off the area. It appears that the firefighter was steamed burned while doing so.*

The second-highest number of fireground burn injuries were to the face:

Fire suppression – minor - face
*Firefighter reports while operating at a structure fire he suffered thermal burns to the right side of his forehead and temple area. The member was wearing PPE.*

Fire suppression – minor – face
*Firefighter was riding up as acting officer on Engine. Firefighter and his crew were assigned to make an offensive fire attack. There was heavy smoke coming from a single story with no active flames. The firefighter made entry into the structure; firefighter gave a reading of 600 degrees from his thermal imaging camera. Firefighter stated he felt a lot of heat on around his neck and ears and exited the structure immediately. The division chief checked conditions and determined the mode of operation should be switched to defensive. The injured firefighter began firefighting the fire from outside the structure as the Incident Commander changed modes to defensive. The injured firefighter continued to work until he got low on air. The injured firefighter then went to rehab and it was discovered he had two blisters on his face. One blister was on his forehead and the other on his left cheek. The firefighter melted the rubber exterior brim lining on his helmet and melted the rubber on his radio lapel mic. No other injuries were reported on the firefighter. He was immediately assessed by EMS and was transported as precautionary to a clinic for evaluation. The injured firefighter was given a tetanus shot and burns were cleaned. Firefighter was released and returned to full duty and finished out the remaining shift.*

## Example Injury Narratives (continued)

Although several fire fighters suffered burns to their hands on the fireground, the commission in 2015 received an equal number of reports of burns to the hands suffered during station duties:

Fire suppression – minor – hand
*The individual was on a handline at a two-alarm structure fire performing exposure protection. He and his officer were between a house and fence when he felt a burning sensation to his right hand. He was on air and in full PPE. When he went to rehab, he removed his glove and noted redness and two blisters near his index and middle knuckles on his right hand. He continued on at the scene and finished his shift.*

Fire suppression – serious – hand
*While deploying hose to the front door and before he donned his gloves, the firefighter received a burn to the back of his right hand. He was sent to hospital for treatment, and will be off for approximately seven days.*

Station duties – minor – hand
*Firefighter was carrying a hot burning pot of grease out of oven and into backyard. Grease spilled out over sides burning a small spot on fifth digit of left hand and second digit of right hand. No medical attention sought.*

Fire fighters were also burned on their necks and shoulders during fireground operations, most often as the result of pulling ceiling, advancing hoselines, or during rescues:

Fire suppression – serious – neck
*Firefighter was pulling ceiling in a structure fire. Firefighter grabbed a piece of sheetrock that was hanging in the doorway of his escape route and pulled down on it with his hands. This dislodged a section of hot debris. It landed on him between his shoulders and helmet while he was in a bent over position. When he stood up the embers got trapped between his collar and hood. This is where he received his burns.*

A small number of fire fighters suffered burn injuries to multiple parts, most often due to extremely hot or otherwise catastrophic conditions:

Fire suppression – serious – multiple parts, upper body
*The firefighter was on the initial attack hoseline at a house fire and was attempting to make a push inside near where heavy fire involvement was. He sustained second degree burns on his hands and forearms, and first degree burns (sunburn-looking) to his shoulders. He also received minor second degree burns to his cheek. His turnout coat was removed from service due to thermal damage through the shell and into his liner. His gloves were removed from service as well. His SCBA mask was sent to be tested at our SCBA station and was removed from service by personnel who noticed some distortion of the mask from heat. All items have been isolated for further evaluation. The employee was treated at the [city clinic] and sent home. He remains off with restrictions for duty.*

Fire suppression – serious – multiple parts, upper body
*During primary search of second floor [at a residential structure fire], the fireplace collapsed. Firefighter fell from second to first floor, trapped in rubble. Burns to torso and bilateral extremities.*

# Comparison between the State of Texas (2015) and National Fire Protection Association (NFPA), U.S. Firefighter Injuries – 2014

For the purposes of comparison, the commission has mapped its categories to the NFPA categories as follows:

- "Fireground" includes the commission's Fire Suppression and Rescue – Fire Related.
- "Non-Fire" includes Rescue Non-Fire, EMS and Hazmat.
- "Other On-Duty" includes Fire Prevention, Station Duties and Wellness/Fitness.

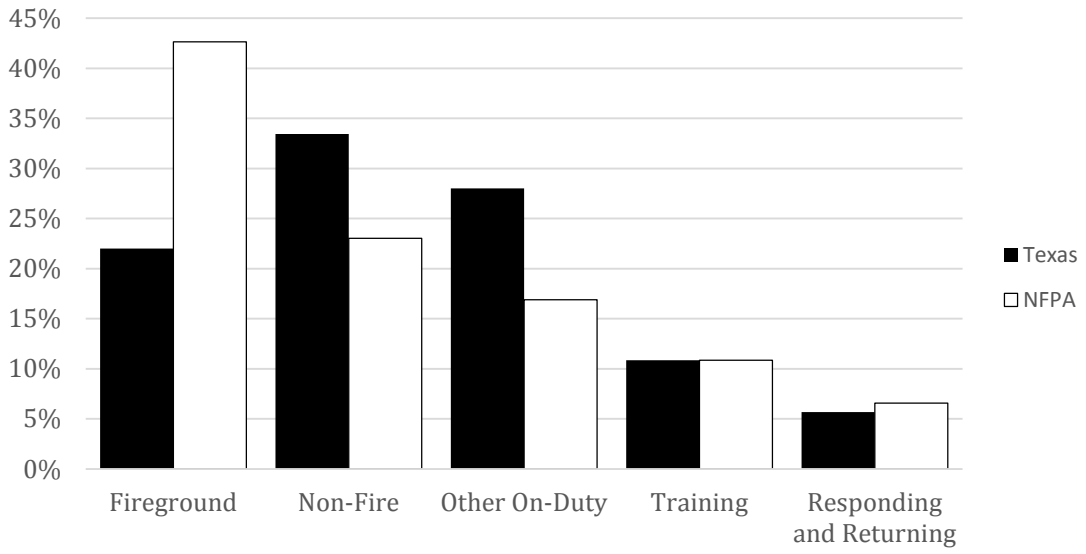
The NFPA's "Responding and Returning" and "Training" categories appear to correspond closely to the commission's categories. (The NFPA numbers include Texas statistics, although the reporting populations may not be the same.)

***Table 23: Comparison of Texas 2015 and NFPA 2014***

| | Texas 2015 | | NFPA 2014* | |
|---|---|---|---|---|
| **Category** | **Count** | **Percent** | **Count** | **Percent** |
| Fireground | 817 | 22% | 27015 | 43% |
| Non-Fire | 1244 | 33% | 14595 | 23% |
| Other On-Duty | 1043 | 28% | 10695 | 17% |
| Training | 405 | 11% | 6880 | 11% |
| Responding and Returning | 212 | 6% | 4165 | 7% |
| **Total** | **3721** | **100%** | **63350** | **100%** |

* *NFPA data is from U.S. Firefighter Injuries – 2014, copyright© 2015, National Fire Protection Association, Quincy, MA.*

***Figure 9: Injuries by Activity Percentages – Comparing Texas 2015 and NFPA 2014***



# 2015 Findings/Recommendations

The agency staff has been challenged by the fire fighter advisory committee to increase the percent of reporting departments. Staff will continue to reach out to all regulated entities that did not file any injury reports or "non-injury" reports in an effort to increase this percentage.

The advisory committee also charged staff with analyzing the relationship of call volume to the number of injuries reported. Staff will review existing state and federal resources to determine whether any conclusions can be drawn related to call volume. (It may prove difficult to compare the number of incidents statewide to injuries reported by commission-regulated entities, which comprise only a portion of the state's fire service.) The agency, however, encourages departments to compare local call volumes with their own reported injury statistics, and stands ready to provide any assistance required. (The agency can, for example, prepare charts, graphs or statistical tables similar to those found in this report, filtered for individual departments.)

The commission further encourages departments to report cancer diagnoses and exposures. There is a great deal of awareness growing throughout the fire service community about the long-term health consequences of the profession; the commission's injury reporting is uniquely positioned to gather this information in order to help state leaders gain a better understanding of these challenges statewide.

***Commission-adopted standards***

The commission has adopted several NFPA and other nationally recognized standards to help keep Texas fire protection personnel safe. This list summarizes the relationships between some of the Texas laws and national standards and is not intended to be all-inclusive:

**Texas Government Code**

§419.040, Protective Clothing

§419.041, Self-Contained Breathing Apparatus

§419.042, Personal Alert Safety Systems

§419.043, Applicable National Fire Protection Association Standard

§419.044, Incident Management System

§419.045, Personnel Accountability System

§419.046, Fire Protection Personnel Operating at Emergency Incidents

§419.047, Commission Enforcement

**Texas Administrative Code**

CHAPTER 425 FIRE SERVICE INSTRUCTORS

§443.9 National Fire Protection Association Standard

CHAPTER 435 FIRE FIGHTER SAFETY

- §435.21 Fire Service Joint Labor Management Wellness-Fitness Initiative
- §435.23 Fire Fighter Injuries
- §435.25 Courage to be Safe So Everyone Goes Home Program
- §435.27 Live Fire Training Structure Evolutions

CHAPTER 451 FIRE OFFICER

CHAPTER 457 INCIDENT SAFETY OFFICER CERTIFICATION

**Other resources**

See also the commission's web page: NFPA Standards adopted by the commission.