

Fire Investigator Safety Series

Series 1: Introduction to Fire Investigator Scene Safety



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TRACE Fire Protection and Safety Consultants, Ltd.
Richmond, Kentucky USA


Welcome!



Introduction to
Fire Investigator Scene Safety

Disclaimer

Please note, the opinions expressed during this presentation are those of the presenter and may not reflect the opinions of the Technical Committee on Fire Investigations or the National Fire Protection Association (NFPA).





Fire Investigator Safety Series

The “Fire Investigator Safety Series” will be comprised of four programs that will provide the participants an opportunity to explore the common health and safety hazards found on the fire and explosion investigation scene and during subsequent evidence inspections and other post scene analysis.

Fire Investigator Safety Series

Through this exploration process the participant will be able to put control mechanisms in place to eliminate hazards or limit potential exposure to those working on the fire or explosion scene or during post scene activities.



Series 2: Hazard and Risk Assessment, the Process



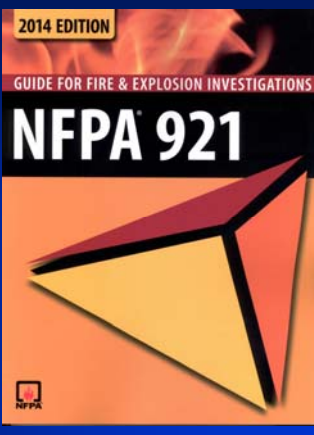
Series 3: Personal Protective Equipment (PPE), Selection and Use

Series 4: Safety and Health Programs and Program Management



References


Primary
Guide for Fire &
Explosion
Investigations,
NFPA 921 2014
Edition



Bibliography

The Bibliography is included as Appendix A of the participants handout.


Copies of the reports included in this presentation can be obtained from the TRACE Fire Protection and Safety website www.tracefireandsafety.com



Links to the US Government websites are provided in the Bibliography. Appendix A

I. Introduction

13.1* General. Fire scenes, by their nature, are dangerous places. Fire investigators have an obligation to themselves and perhaps to others (such as other investigators, equipment operators, laborers, property owners, attorneys) who may be endangered at fire scenes during the investigation process.








A. The Problem

A. The Problem?

How many fire investigators die or suffer injuries while investigating fires?



Death in the line of duty...

Fire Investigator Dies After Being Struck by a Chimney That Collapsed During an Origin and Cause Fire Investigation - New York


SUMMARY
On January 10, 2010, a 43-year-old male came to work for the private emergency medical and ambulance service in the city of New York. He was assigned to investigate a fire in a residential building on January 14, 2010. The victim, as part of his regular duties, went with an ambulance to the scene of the fire. He was assigned to investigate the fire and to assist the fire department in the investigation. About 75 minutes into the investigation, the victim was struck by a chimney that had collapsed. The victim was killed on the spot. The cause of the death was a fall from a height of approximately 10 feet. The victim was wearing a hard hat and safety glasses, but he was not wearing a fall protection device. The investigation is ongoing.

The Public Safety Investigation and Prevention Program
The purpose of this program is to identify and prevent occupational safety and health hazards in the workplace. The program is a joint effort of the Occupational Safety and Health Administration (OSHA) and the National Institute for Occupational Safety and Health (NIOSH). The program is designed to provide a comprehensive approach to occupational safety and health. The program is a key component of the Department of Labor's commitment to workplace safety and health.

Figure 1: Fire scene

1. Fire Fighter Fatality Investigation and Prevention Program, NIOSH

“Fire Investigator Dies After Being Struck by a Chimney That Collapsed During an Origin and Cause Fire Investigation - New York” Report issued May 14, 1999



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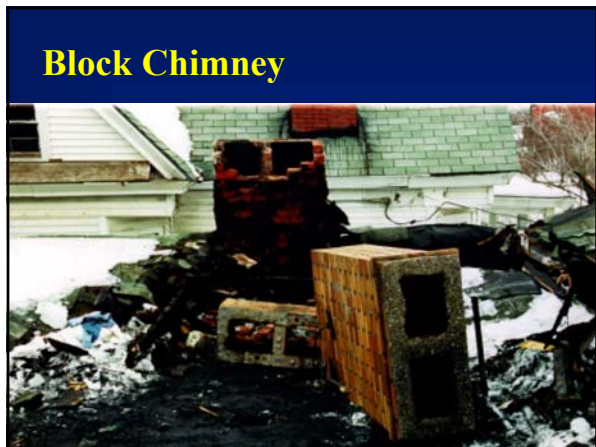
Figure 1: Fire scene





Fire Scene

SUMMARY
On January 19, 1999, a 43-year-old male career fire investigator (the victim) was killed during an investigation to determine the origin and cause of a residential fire that occurred on January 14, 1999. The victim, as part of his regular duties, met with an insurance adjuster, a private fire investigator and an electrical consultant at the fire scene about 1030 hours on the day of the incident. All four men proceeded to the attic area of the remaining structure to conduct the investigation. About 10 minutes into the investigation, the insurance adjuster left the area and proceeded to the floors below to continue his review of the damage. The other three men, including the victim, remained in the attic and sifted through debris looking for clues to the origin of the fire. After working for 2 1/2 hours near the front section of the attic, they moved to an area in proximity to a brick chimney that was free-standing about 13 feet above the floor level of the attic. After discussing the stability of the chimney, the three men decided to continue work near the chimney. Note: Although all three men commented to one another that they had seen the chimney swaying slightly in the gusty breeze, they believed it was fairly stable because it had been free-standing for 5 days, in all weather conditions. Also, the chimney had not moved when the private investigator pushed and pulled on the stabilizing bar that was connected to it. The victim had positioned himself about 8 feet away and directly in line with the base of the chimney while the other investigators, although also in proximity to the chimney, were off to one side. The three men were sifting through and inspecting the debris when the chimney suddenly and silently collapsed and fell onto the victim. The sound of the chimney hitting the floor alerted the other two men. After realizing what had occurred, they tried to lift the chimney off the victim, but it was too heavy. One of the men ran to a neighboring house and called 911. At this time another fire investigator arrived on the scene and was apprised of the situation. He used his fire radio to call for a rescue company. Within a few minutes, two fire Chiefs arrived on the scene and the five men were able to lift the chimney off the victim. Emergency cardiopulmonary resuscitation was initiated and the victim was transported to the local hospital where he later died of his injuries. NIOSH investigators concluded that, to minimize the risk of similar occurrences, fire departments should:



Block Chimney



Arson Investigator Dies from Injuries Sustained from a Fall During an Arson Investigation. Illinois Report issued April 23, 2001



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

A **NIOSH** *Public Health Statement*

Arson Investigator Dies from Injuries Sustained from a Fall During an Arson Investigation—Illinois

10/1985.03

ON APRIL 18, 2001, at 11:31 A.M., Const. Dwight notified the local fire department of a structure fire at a residential dwelling. As the firefighters worked to contain the fire, Const. Dwight was directed to investigate the cause of the fire. While investigating, Const. Dwight fell from a roof of a structure under construction. He sustained injuries to his back and neck, which resulted in his death on April 19, 2001.


Additional information: Const. Dwight was a member of the Fire Department in Illinois. He had been working for the Fire Department for 15 years.

NIOSH investigators are currently conducting an investigation into the cause of this death. The results of this investigation will be published in a future issue of the *Public Health Statement*.

For more information, contact:
 NIOSH, Office of Safety and Health, 400 Capitol Mall, SE, Atlanta, GA 30332
 Phone: (404) 843-8300
 TDD: (404) 843-8300
 Fax: (404) 843-8300
 E-mail: dhsp@cdc.gov
 Website: www.cdc.gov/niosh

A. The Problem?

- How many fire investigators die or suffer injuries while investigating fires?
- How many fire investigators are affected by exposure to health risks while investigating fires?



Fire Investigator Statistics?

- Fire Investigation Community is a sub-set population and specific data is generally not known.
- Fire Investigation Community has both public and private sector members.
- Currently, only Public Sector Investigators are included in the NIOSH reports.
- Public Sector Fire Investigators are often transient and frequently move to another area of the Fire Service.



A. The Problem?

- How many fire investigators die or suffer injuries while investigating fires?
- How many fire investigators are affected by exposure to health risks while investigating fires?
- What types of diseases are fire investigators exhibiting as a result of the exposures?



Study of Cancer among US Fire Fighters

- In a NIOSH update, April 23, 2010, it was reported that NIOSH and the United States Fire Administration (USFA) were partnering to study Cancer among Firefighters.
- NIOSH Bibliography : 139 Titles and Abstracts

A. The Problem?

- How many fire investigators die or suffer injuries while investigating fires?
- How many fire investigators are affected by exposure to health risks while investigating fires?
- What types of diseases are fire investigators exhibiting as a result of the exposures?
- Where is the research to indicate that there are Safety and Health Risks on the fire scene?





B. Research and Literature

1. NIOSH Health Hazard Evaluation Report; Bureau of Alcohol, Tobacco, and Firearms, May 1998

The Bureau of Alcohol, Tobacco, and Firearms (ATF) in April 1996 contacted the National Institute for Occupational Safety and Health (NIOSH) and requested a health hazard evaluation (HHE) regarding respiratory hazards associated with fire investigations.

Report Recommendations



1. The ATF should require their investigators to wear appropriate respiratory protection when performing fire scene investigations.



Report Recommendations

SCBAs would most likely not be practical during most fire scene investigations;

- Half-Face Air-Purifying Respirators combination filter cartridges (high-efficiency particulate, VOCs, acid mists, and formaldehyde)
- Powered Air-Purifying Respirators with the appropriate filter cartridges should be used.
- *Non-IDLH Atmospheres*

Report Recommendations

2. The ATF should establish a respiratory protection program for their fire investigators and ensure that it complies with the requirements described in 29 CFR 1910.134 (OSHA Standard).



Respiratory Protection Program

- a. Written operating procedures
- b. Appropriate respirator selection
- c. Employee training
- d. Effective cleaning of respirators
- e. Proper storage
- f. Routine inspection and repair
- g. Exposure surveillance
- h. Program review
- i. Medical approval
- j. Use of approved respirators

Fit Testing?



Report Recommendations

3. The use of mechanical ventilation equipment that removes the contaminants from the areas where fire investigators are working should be utilized whenever possible.



Ventilation

Alteration of the fire scene (removing windows, doors, etc.) that promotes natural ventilation should also be considered when it would not affect the preservation of the fire scene.

- Inlet and Exhaust remote
- Inlet and Exhaust same location

Report Recommendations

4. The use of other protective clothing should be implemented.

Protective Eye ware Hearing Protection
Head Protection Protective Clothing
Safety Shoes/Boots Hazard Specific Items
Gloves

Report did not include recommendations



Report Recommendations

4. To reduce the potential for contaminants being carried home by fire investigators, the use of disposable coveralls, boots, and gloves should be considered.

 - Laundering of any potentially contaminated clothing should be provided by a contractor who is aware of the contamination potential.

Report Recommendations

4. ATF should also train its fire investigators in the use of appropriate decontamination procedures utilized by emergency responders.



2. NIOSH Health Hazard Evaluation Report 2004-0368-3030; Bureau of Alcohol, Tobacco, Firearms and Explosives, January 2007





ATF request to NIOSH

August 19, 2004, the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) contacted the National Institute for Occupational Safety and Health (NIOSH) requesting an investigation concerning potential exposures during fire scene investigations. Concerns were raised about the presence of **contamination of work uniforms upon completion of an investigation, removal of the contamination following home laundering, and contamination of home washing machines from contaminated uniforms.** At the time of the request, employees had not reported health effects associated with chemical exposures during fire scene investigations.

Report Conclusions

1. Contamination of a washing machine/dryer used by an ATF fire scene investigator to launder his/her uniform is unlikely.
2. Contamination of subsequent loads of laundry is also unlikely.

Report Conclusions

3. There is a potential for contamination of other clothing being laundered with soiled uniforms.
4. Due to the number of uncontrolled variables in this study, definitive conclusions cannot be made as to whether a significant amount of PAH contamination was removed during the laundering of soiled field uniforms.



Report Conclusions

- Additional studies are needed to provide for better comparisons of field samples and known contaminants.

Report Recommendations

- Due to the potential for exposure to PAHs, some of which may be carcinogenic, NIOSH investigators recommend the use of protective clothing for ATF agents involved in fire scene investigation.

Polynuclear Aromatic Hydrocarbons (PAHs)

Polynuclear Aromatic Hydrocarbons, (PAHs)

Table 1
Phase 2: Field Sample Collection and Analysis of Cotton Patches
Analyzed October 27-28, 2004

PAH Compound	Levels Detected (estimated)
Naphthalene	0.001-0.2 µg/sample
Acenaphthylene	0.001-0.04 µg/sample
Acenaphthene	0.001-0.04 µg/sample
Fluorene	0.001-0.04 µg/sample
Phenanthrene/Anthracene	0.001-0.2 µg/sample
Fluoranthene Pyrene	0.001-0.2 µg/sample
Chrysene Benzo(a)anthracene	0.001-0.2 µg/sample
Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene	0.001-0.2 µg/sample

Limit of Detection = estimated 0.001 µg/sample

Micrograms (µg)



Report Recommendations

- 2. To reduce the potential for carrying these contaminants home, disposable coveralls should be worn at the fire scene then discarded when the investigation is finished prior to entering a personal or official vehicle.

Cross Contamination

- Alternatively, a professional laundry service could be used to launder the uniforms currently worn by fire scene investigators.



Report Recommendations

- 3. ATF agents should wear disposable, chemical resistant gloves to further protect themselves from dermal exposures at a fire scene.





C. Additional Research

- “Characterization of Firefighter Exposures During Fire Overhaul”
- “Firefighter Exposure to Smoke Particulates”

[http://www.cdc.gov/niosh/firefighters/pdfs/Daniels-et-al-\(2015\).pdf](http://www.cdc.gov/niosh/firefighters/pdfs/Daniels-et-al-(2015).pdf)

Received 20 October 2014
Revised 21 January 2015
Accepted 26 January 2015

Workplace

ORIGINAL ARTICLE

Exposure–response relationships for select cancer and non-cancer health outcomes in a cohort of US firefighters from San Francisco, Chicago and Philadelphia (1950–2009)

Robert D Daniels,¹ Stephen Bertke,¹ Matthew M Dahm,¹ James H Yin,¹ Travis L Kubak,¹ Thomas R Hales,¹ Dabuj Baris,² Shweta H Zafra,² James J Braunton,³ Kathleen M Waters,¹ Lynne E Pinkerton¹

ABSTRACT
Objectives: To examine exposure–response relationships between categories of firefighting exposure and select outcomes among previously studied US cancer firefighters.
Methods: Eight cancer and four non-cancer outcomes were examined using conditional logistic regression. Incidence density weighting was used to adjust each case to 100 person-years of observation. Age, weight, time spent on the job, and time spent in structural firefighting were used as exposure variables. We compared 758 and 200 cases of lung and prostate cancer, respectively, with 2000 person-years of observation.
Results: For lung cancer, age and structural firefighting were used to estimate the influence of time spent in firefighting on cancer risk. For prostate cancer, age, exposure and cancer grade were used. Among 11,800 male firefighters eligible for the study, there were 103 cancer deaths and 200 cancer incidence cases. Significant positive associations between the most and long cancer mortality and incidence were noted. A similar relation between prostate mortality and time on the job was observed. The long cancer associations were nearly linear in cumulative exposure, while the association with prostate mortality was attenuated at higher exposure levels and greater for more exposures. Significant negative associations were noted for the exposure categories and colorectal and pancreatic cancer, suggesting a healthy worker effect possibly related to medical screening.
Conclusions: Lung cancer and prostate mortality risks were modestly increasing with firefighter exposures. These findings add to evidence of a causal association between firefighting and cancer. Nevertheless, small effects need further investigation. We plan to continue to follow the occurrence of disease and death in this cohort.

What this paper adds

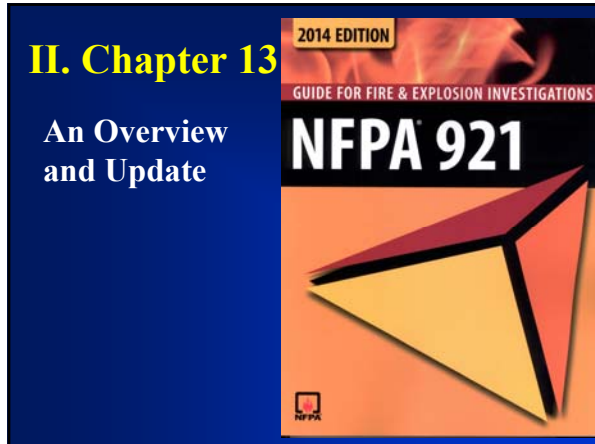
- The study addresses limitations to previous research regarding exposure–response relationships by conducting nested analyses of disease rates among cancer firefighters in a large general cohort.
- Comparison of almost 20,000 cancer firefighters with over 1000 cancer-related deaths and 2000 cancer incidence cases, this study is among the largest ever conducted for the purpose of firefighter research and is the first with adequate statistical power for detailed examinations of exposure–response characteristics.
- Using department records, we defined dose categories of exposure based on firefighter assignments and fire call information. This is the first study to make the time elapsed during fire calls by cancer risk.
- We found previously unreported modest exposure–response for lung cancer and prostate mortality. These findings add to evidence of a causal association between firefighting exposures and cancer.

Additional Resources

NIOSH Firefighter Cancer Resources:
<http://www.cdc.gov/niosh/firefighters/cancer.html>

Firefighter Cancer Support Network:
www.firefightercancersupport.org





Safety Chapter a Historical Perspective
NFPA 921 1992 Edition
Chapter 10 Safety, 2 Pages
10.1 General

- Investigating the Scene Alone
- Safety Clothing and Equipment
- Fire Scene Hazards
- Personal Health and Safety

Chapter 10 Safety

10.2 Factors Influencing Scene Safety
Structural Stability
Utilities
Standing Water
Safety of Bystanders
Safety of the Fire Scene Atmosphere



Chapter 10 Safety; 1995 Edition

Major re-write (Line in the Margin)
Still 2 pages

Added Sections

- Investigator Fatigue
- Electrical Hazards

Chapter 10 Safety; 1998 Edition

- Still 2 pages
- Minor word changes to:
 - 10.2.3 Utilities
 - 10.2.4 Electrical Hazards
 - 10.2.5 Standing Water
 - 10.2.6 Safety to Bystanders

Chapter 10 Safety; 2001 Edition

- 2.5 Pages
 - Major re-write (Line in the Margin)
- Added Sections
- 10.3 Criminal Acts of Terrorism
 - 10.3.1 Secondary Devices
 - 10.3.2 Residual Chemicals
 - 10.3.3 Biological and Radiological Terrorism
 - 10.3.4 Exposure to Tools and Equipment



Chapter 12 Safety; 2004 Edition

- 2.5 pages

Added Sections

- 12.1.5 Investigator Fatigue
- 12.5.1.2 Discussion of rest, fluids, and nourishment
- 12.4 Safety in Off-Scene Investigation Activities

Chapter 12 Safety; 2008 Edition

- 5 pages
- Task Group Formed
- OSHA references added to 12.1 General

Added Sections

- 12.1.2 Hazard and Risk Assessment
- 12.2.5 Electrical Hazards revised

Chapter 12 Safety; 2011 Edition

- 9 pages
- Task Group Re-Formed
- Major Changes
 - 12.1.1 General Injury/Health Statistics
 - 12.1.2 Health and Safety Programs
 - 12.1.2.1.2 Hazard and Risk Assessment
 - 12.3.3.2 Lockout/Tagout



Chapter 12 Safety; 2011 Edition

Major Changes

- 12.3.7.3 Mechanized Equipment Hazards

- 12.4 Safety Plans

Chapter 12 Safety; 2011 Edition

Major Changes

- 12.4.1 Hazard and Risk Assessment, Inclusion of the Form as an Appendix item.



NAFI Sample Hazard and Risk Assessment				
Task/Control Name, Safety Rating		Date	Assessment Conducted By	
Type of Record	Risk	Control Methodology	Assessment	PPH
1. Personal Records	W/S	Engineering	Administration	PPH
2. Personal Records				
3. Personal Records				
4. Personal Records				
5. Personal Records				
6. Personal Records				
7. Personal Records				
8. Personal Records				
9. Personal Records				
10. Personal Records				
11. Personal Records				
12. Mechanical Records				

- 12.4.2 Site Specific Safety Plans

Chapter 12 Safety; 2011 Edition

Major Changes

- 12.4.3 Management of Plans and Site Safety

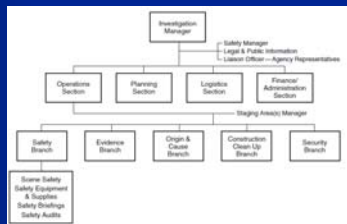


FIGURE 12.4.3 An Example of How the Safety Function May Be Completed at a Complex Investigation.



Chapter 12 Safety; 2011 Edition

Major Changes

- 12.5 Chemical and Contaminant Exposure
- 12.6 Personal Protective Equipment (PPE)
- 12.7 Emergency Action Plans
- 12.8 Post Scene Activities
- 12.10.4 Drug Labs

Chapter 13 Safety; 2014 Edition

- 10 pages

Major Changes

- Correction of Editorial Issues
- Addition of Color Photographs
- First Edition with Photographs in the Safety Chapter

NFPA 921, 2017 Edition

First Draft Meeting; San Antonio, TX
April 28-30, 2015

- 283 Public Inputs have been received.
- Chapters 12, 13 (Safety) and 21 have no public input.



Safety Chapter Changes

Thanks to:

- Two task groups that worked on the 2008 and 2011 Editions
- Those that provided Public Input (Proposals) and Comments
- Dan Churchward for being a Champion of the Safety Chapter during my absence at several important meetings.
- To the Technical Committee on Fire Investigations for their understanding of the importance of Safety.

III. Safety and Health Programs

Question?

Where does Safety and Health Fit in Your Workplace?

Where does Safety and Health Fit in your Workplace?

- Safety and health are an integral part of our operations.
__ Yes __ No __ Don't know
- Teamwork is apparent in all parts of the organization.
__ Yes __ No __ Don't know
- Managers and supervisors are out on the floor frequently and always observe the company safety and health rules.
__ Yes __ No __ Don't know
- Employees are encouraged to identify safety and health hazards and correct them on their own.
__ Yes __ No __ Don't know
- Employees have full and open access to all the tools and equipment they need to do their job safely.
__ Yes __ No __ Don't know



**Where does Safety and Health Fit in
your Workplace?**

Detailed Survey

http://www.osha.gov/SLTC/study/safety/health/smgd_mgt_lead_leadershipquiz.html

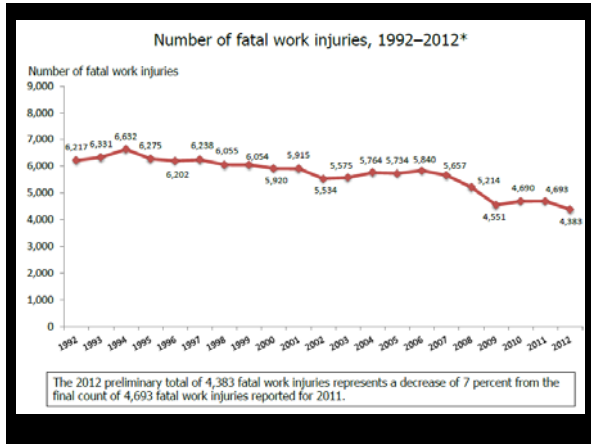
Question?

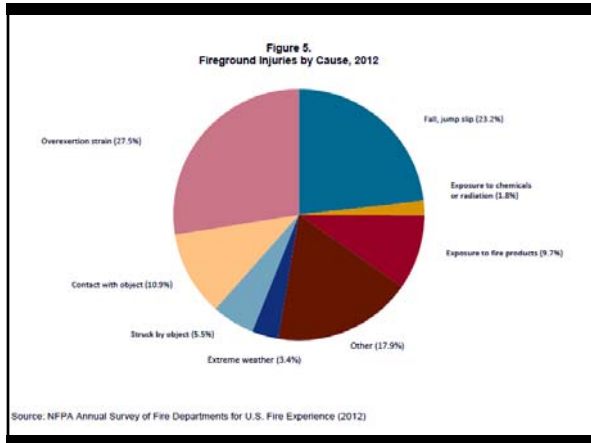
How are we getting injured during
the investigation of a fire or explosion
scene?

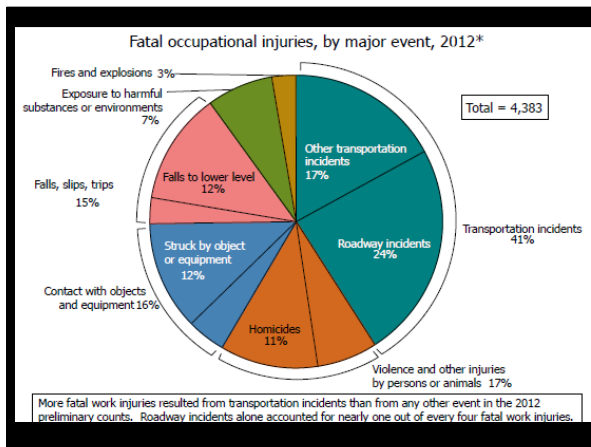
Fire Fighter Fatalities, 2012

- 2012 was the fourth consecutive year in which the total number of firefighter fatalities was below 100.
- 2011 and 2012 had by far the lowest number of firefighter deaths on record, and the annual average number of firefighter deaths has dropped to 88 during the period 2003 to 2012.
- 2012 was the first year in which the on-duty fatalities due to sudden cardiac death dropped below 30.
- The 12 deaths that occurred at structure fires in 2012 was the fewest ever recorded.

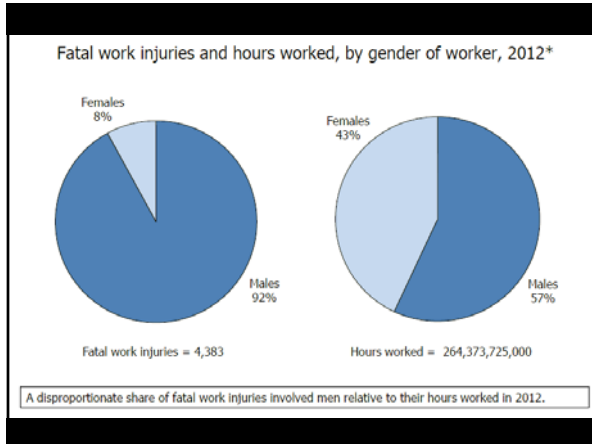


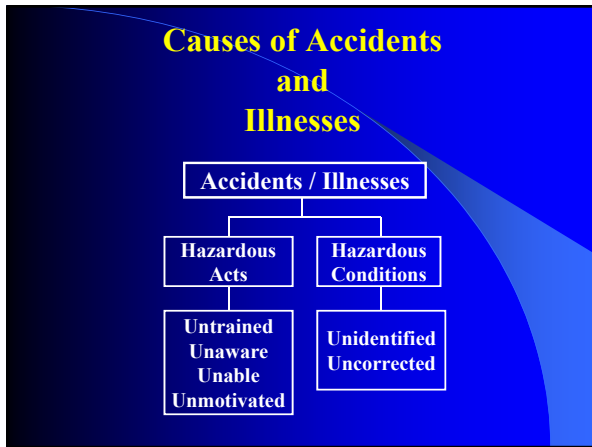


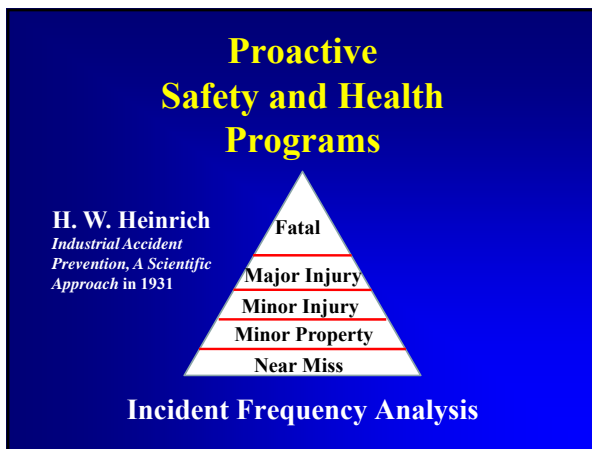














Purpose of Safety and Health Programs?

Objective

- “To ensure every employee works in a safe environment.”
- “To minimize safety risk and health hazards”

Purpose of Safety and Health Programs?

Objective

Goal of Safety and Health Program

- “To have each employee return home in the same condition as they arrived to work.”

Purpose of Safety and Health Programs?

Objective

Goal of Safety and Health Program

Purpose of OSHA

- Establish Minimum Standards
- Standardization and Benchmark
- Eliminate Imminent Dangers





In a press release he explained the problem this way: OSHA has enough inspectors to visit every workplace in the US for 15 minutes once every 133 years.

David Michaels, PhD, MPH Assistant Secretary
The current head of OSHA, for over 30 years.

Accidents, Illnesses and Injuries


Why don't we do tasks safely at work?



Why don't we do tasks safely at home?

It will not happen to me!

Accident Costs



49 Billion Dollars

3.9 Million lost workdays (Average 20 days per incident)


1 out of 20 will suffer a serious injury or illness

Pain and suffering

Damage to the Environment



Accident Costs!



Direct Costs

Indirect Costs

Direct Costs

Medical

Insurance Premiums

Employee Compensation



Indirect Costs

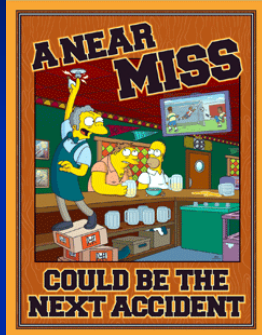


- Repair/Replacement
- Overtime Pay
- Lost sales
- Hire and Train new employees
- Reduced Production
- Clean Up
- **Impact on Employee and Family**



Accidents, Illnesses and Injuries

- Near Miss Incident



Safety 3rd!

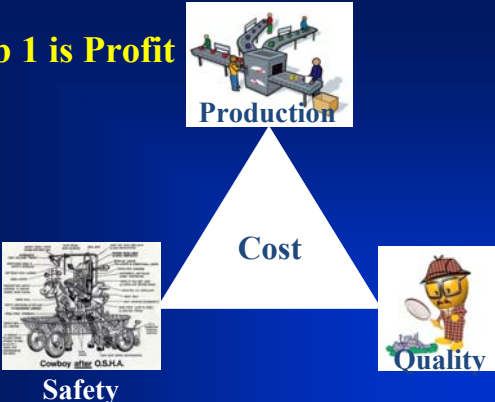


<http://www.mikeroweworks.com/2009/08/safety-third-huh/>





Job 1 is Profit




Production

Safety

Quality

Cost


Woodworkers Journal



Marc Adams,
Marc Adams School of Woodworking
Franklin, Indiana

“Safety is a culture” or is “Safety is a skill”

**Introduction to Fire Investigator
Scene Safety**



Questions?



**Introduction to Fire Investigator
Scene Safety**

Thank You for Your Participation!



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