Incident Safety Officer

ISO-Student Manual

2nd Edition, 2nd Printing-June 2004

FEMA

FEMA/USFA/NFA
ISO-SM
June 2004
2nd Edition, 2nd Printing

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U.S. DEPARTMENT OF HOMELAND SECURITY

FEDERAL EMERGENCY MANAGEMENT AGENCY

UNITED STATES FIRE ADMINISTRATION

NATIONAL FIRE ACADEMY

FOREWORD

On March 1, 2003, the Federal Emergency Management Agency (FEMA) became part of the U.S. Department of Homeland Security. FEMA's continuing mission within the new department is to lead the effort to prepare the nation for all hazards and effectively manage federal response and recovery efforts following any national incident. FEMA also initiates proactive mitigation activities, trains first responders, and manages the National Flood Insurance Program and the U.S. Fire Administration.

FEMA's U.S. Fire Administration (USFA) serves as the agency fire protection and emergency response community expert. It is located at the National Emergency Training Center in Emmitsburg, Md., and includes the National Fire Academy and the Emergency Management Institute. The mission of the USFA is to save lives and reduce economic losses due to fire and related emergencies through research and training, public education and coordination with other federal agencies and fire protection and emergency service personnel.

To achieve the USFA's legislated mandate (under Public Law 93-498, October 29, 1974), "to advance the professional development of fire service personnel and of other persons engaged in fire prevention and control activities," the USFA's National Fire Academy offers a diverse delivery system. Courses are delivered at the Emmitsburg campus and throughout the nation in cooperation with state and local fire training organizations.

In recent years increasing responses to a wide variety of emergency situations have raised dramatically the fire service's awareness of the need for responder safety programs. These programs are crucial for all firefighters who respond to emergency situations. One of USFA's operational objectives is to reduce by 25 percent the loss of life of firefighters, whether in a large department or in a small, rural fire company.

The NFA believes that the Safety Officer's responsibilities fall into two clear-cut categories: those associated with responding to and operating at the incident scene and those associated with managing the day-to-day affairs of the department. Therefore, in 1993 the NFA developed two courses, one called *Incident Safety Officer* and the other called *Health and Safety Officer*. These courses were completely revised in 2003.

The staff of the USFA is proud to join with state and local fire agencies in providing educational opportunities to the members of the nation's fire services, in an effort to reduce the number of firefighters and other responders killed and injured in the line of duty or as a result thereof.

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COURSE SCHEDULE

Unit 1:	Introduction
Unit 2:	Firefighter Fatality and Injury Data
Unit 3:	Principles of Risk Management
Unit 4:	Safety Responsibilities
Unit 5:	Current Issues
Unit 6:	Operational Risk Management
Unit 7:	Process Application

UNIT 1: INTRODUCTION

COURSE GOAL

To provide fire department members with the knowledge and skills to perform the duties of the Incident Safety Officer (ISO) during incident operations and training evolutions.

ENABLING OBJECTIVES

The students will:

1. *Describe the history of the Incident Command System (ICS).*

2. *Describe the key elements of the ICS that affect the duties and responsibilities of the ISO.*

INTRODUCTION

Student Manual

The Student Manual (SM) is designed to be used minimally during class. There is space to make notes on important information that is presented during the lecture. The instructor will ask you to use the SM during assigned activities.

Individual Student Introductions

You will be asked to give the following information during student introductions:

- name, department, and position;
- what you hope to take away with you upon completion of the course; and
- an incident safety problem within your department.

COURSE GOAL, SCOPE, AND TARGET AUDIENCE

Goal: To provide fire department members with the knowledge and skills to perform the duties of the Incident Safety Officer (ISO) during incident operations and training evolutions. The primary focus is on developing decisionmaking skills through the recognition of cues that affect firefighter safety.

Scope: The fire department Safety Officer responsibilities fall into two distinct categories: those associated with responding at the incident scene, and those associated with managing the department's occupational safety and health program. The ISO focuses on the former.

This is an incident-specific, scenario-oriented course designed to teach students what an ISO needs to know at an incident, using instructor-led discussion, multimedia activities, and group dynamics to convey instructional points.

Audience: Fire department members who may be designated by the Incident Commander (IC) as an ISO while working within an ICS. These assignments may occur during firefighting, emergency medical services (EMS), special operations incidents, and during training evolutions.

HISTORY OF THE INCIDENT COMMAND SYSTEM

In the early 1970's, Southern California experienced several devastating wildland fires. The overall cost and loss associated with these fires totaled $18 million per day. This multijurisdictional disaster was the impetus for the development of an improved interagency Incident Management System (IMS) known as the ICS. The ICS is one of the beneficial results of a federally funded project called FIRESCOPE that was convened after these fires, and whose charter was to examine various aspects of interagency response to incidents.

FIRESCOPE derives its name from **FI**re **RES**ources of **C**alifornia **O**rganized for **P**otential **E**mergencies. The FIRESCOPE ICS is primarily a command and control system delineating job responsibilities and organizational structure for the purpose of managing day-to-day fire and rescue operations. It also is flexible enough to manage catastrophic incidents involving thousands of emergency response and management personnel.

The National Inter-Agency Incident Management System (NIIMS) is another system using ICS that was developed by the wildland community in order to provide a common system for wildland fire protection agencies at the local, State, and Federal levels. The NIIMS organization includes the Bureau of Land Management, the Bureau of Indian Affairs, the U.S. Fish and Wildlife Service, the U.S. Forest Service, representatives of State foresters, and the National Park Service. NIIMS consists of five major subsystems that collectively provide a total systems approach to risk management:

1. The ICS, which includes operating requirements, eight interactive components, and procedures for organizing and operating an onscene management structure.

2. Training that is standardized and supports the effective operations of NIIMS.

3. A qualification and certification system that provides personnel across the Nation with standard training, experience, and physical requirements to fill specific positions in the ICS.

4. Publications management that includes development, publication, and distribution of NIIMS materials.

5. Supporting technologies, such as orthophoto mapping, infrared photography, and a multiagency coordination system that supports NIIMS operations.

Since the development of the ICS, the fire service has experienced several challenges in understanding its application. As a result, inconsistencies in the system began to develop; other hybrid systems came into existence, further distancing a common approach to incident command. A single IMS is critical for effective command and control of major incidents. At such incidents, a single department may interface with other agencies on the local, State, and Federal level. In order to reduce the inherent confusion that may be associated with larger scale incidents, using a common command system is a must.

Recognizing the challenges that were occurring in the fire service in applying a common approach to incident command, the National Fire Service Incident Management System Consortium was created in 1990. Its purpose is to evaluate an approach to developing a single Command system. The Consortium consists of many individual fire service leaders, representatives of most major fire service organizations, and representatives of Federal agencies including FIRESCOPE. One of the significant outcomes of the work done by the Consortium was the identification of the need to develop operational protocols within the ICS, so that fire and rescue personnel would be able to apply the ICS as one common system. In 1993, as a result of this, the IMS Consortium completed its first document: *Model Procedures Guide for Structural Firefighting.* FIRESCOPE adopted this in principle as an application to the Model FIRESCOPE ICS. The basic premise is that the organizational structure found in the FIRESCOPE ICS now is enhanced with operational protocols that allow the Nation's fire and rescue personnel to apply the ICS effectively regardless of what area in the country they are assigned. The National Fire Academy (NFA), having adopted the FIRESCOPE ICS in 1980, has incorporated this material in its training curriculum and will continue to reach the thousands of fire service personnel with one common incident command and control system.

It is important to note that the FIRESCOPE Model ICS has had other applications or modules similar to the structural firefighting applications that have been in place for some time. These create a framework for other activities to operate in and further enhance the use of the ICS. As an example, there are the Multi-Casualty, Hazardous Material, and the Urban Search and Rescue (US&R) applications.

The Federal Emergency Management Agency (FEMA) formally adopted the FIRESCOPE ICS as the IMS for any Federal response required by the agency. Since then, several other Federal agencies have adopted the FIRESCOPE ICS as well.

COURSE OVERVIEW

Unit 2: Firefighter Fatality and Injury Data.

Identify the most common types of firefighter fatality and injury data and identify the common denominators.

Unit 3: Principles of Risk Management.

Understand the risk management model and how it has a positive effect on fire department operations.

Unit 4: Safety Responsibilities.

Identify the requirements for ISO as defined in the National Fire Protection Association (NFPA) 1500, *Standard on Fire Department Occupational Safety and Health Program*, and NFPA 1521, *Standard for Fire Department Safety Officer*.

Unit 5: Current Issues.

Identify safety issues relating to wildland firefighting, highway/traffic safety, terrorism, and fireground communications.

Understand the importance of proper medical treatment and followup care for a health exposure, and the importance of incident scene rehabilitation.

Unit 6: Operational Risk Management.

Understand how risk management affects emergency incident operations. Understand the terminology: pre-emergency risk management, immediate risk, forecasting, operational risk management, and termination of operations.

Unit 7: Process Application.

A brief review and discussion of the course, student evaluations, final examination, and graduation. Also provides students an opportunity to evaluate the status of their department's ISO program.

SUMMARY

The individual assigned as the ISO must have the knowledge, skills, and abilities (KSA's) needed to perform effectively at an incident.

The philosophy of this course is to "weave safety into the current fabric of the organization."

Safety cues. This concept will be used throughout the course. Safety cues are conditions or indications that the ISO needs to be aware of at an incident scene. These conditions or indications could be structural, unsafe acts by personnel, or unsafe conditions. The experienced ISO, when operating at an incident scene, will focus on these safety cues.

STUDENT INFORMATION SHEET

NAME: _____

DEPARTMENT: _____

CITY (OR COUNTY), STATE: _____

POPULATION SERVED BY DEPARTMENT: _____

AREA SERVED BY DEPARTMENT (SQUARE MILES): _____

Department Size:

FULL-TIME/CAREER PERSONNEL: _____

PART-TIME/RESERVE PERSONNEL: _____

VOLUNTEER PERSONNEL: _____

NUMBER OF STATIONS: _____

Organization Delivery Profile

HAZARDOUS MATERIALS: YES NO

CONFINED SPACE/TECHNICAL RESCUE: YES NO

EMS:

ALS FIRST RESPONSE: _____

BLS FIRST RESPONSE: _____

ALS TRANSPORT: _____

BLS TRANSPORT: _____

What I hope to take away from this course:

_____

_____

_____

_____

_____

Safety problem in the department and why:

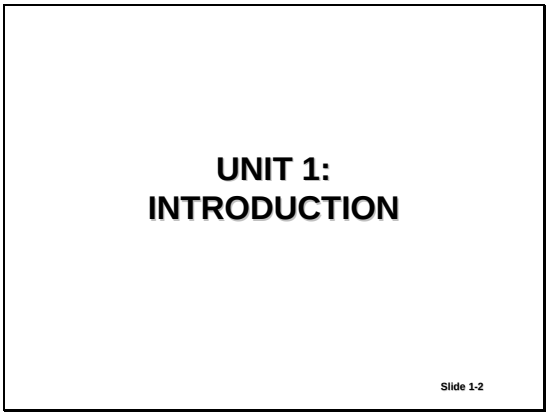
_____

_____

NOTE-TAKING GUIDE

Slide 1-1

Slide 1-2



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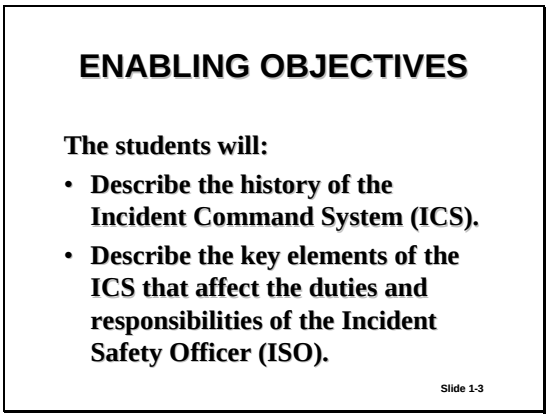

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INCIDENT SAFETY OFFICER

- **Welcome**
- **Instructor introduction**
- **Class roster**
  - **Verification of name, address, telephone number, e-mail address**
- **Student Manual (SM)**

Slide 1-4

Slide 1-5

INDIVIDUAL STUDENT INTRODUCTIONS

- **Complete Student Information Sheet**
- **Give name, department, and position**
- **State what you hope to take away from this course**
- **Identify an incident safety problem within your department**

Slide 1-5

Slide 1-6

VIDEO:

"The Phoenix Fire Department Recovery Process"

Slide 1-6

Slide 1-7

- **Course goal**
- **Scope**
- **Target audience**

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Slide 1-8

COURSE GOAL

- **To provide fire department members with the knowledge and skills to perform the duties of the ISO during incident operations and training evolutions**
- **To develop decisionmaking skills through the recognition of cues that affect firefighter safety**

Slide 1-8

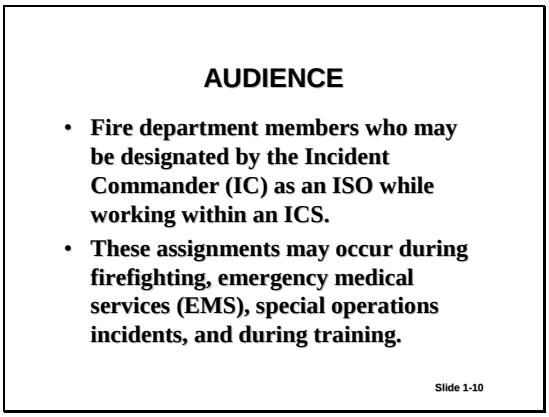
Slide 1-9

SCOPE

- **Two distinct categories:**
  - **Incident scene operations.**
  - **Managing the department's occupational safety and health program.**
- **This course is designed to teach students the duties and responsibilities of an ISO.**

Slide 1-9

Slide 1-10



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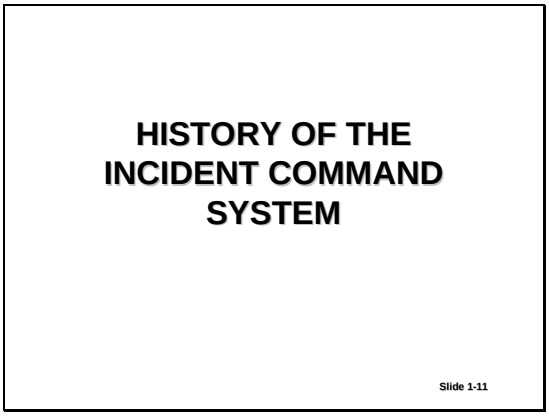

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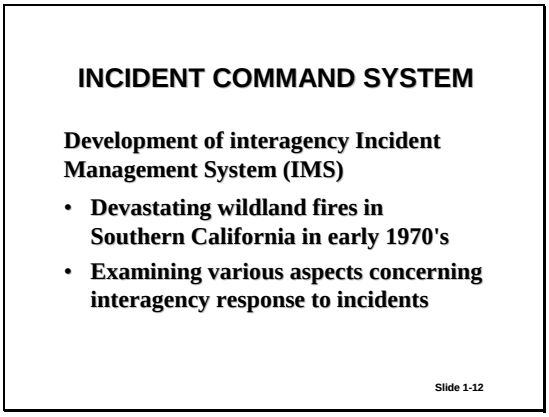


Slide 1-13

FIRESCOPE

- FIre
- RESources of
- California
- Organized for
- Potential
- Emergencies

- Command and control system assigning job responsibilities and organizational structure
- Management of day-to-day operations
- Manage catastrophic incidents

Slide 1-13

Slide 1-14

NATIONAL INTER-AGENCY INCIDENT MANAGEMENT SYSTEM

- Developed by the wildland community to provide a common system
- Includes six agencies
- Consists of five major subgroups

Slide 1-14

Slide 1-15

NEED FOR A SINGLE INCIDENT COMMAND SYSTEM MODEL

- Inconsistencies
- Effective command
- Reduce confusion

Slide 1-15

Slide 1-16

NATIONAL FIRE SERVICE INCIDENT MANAGEMENT SYSTEM CONSORTIUM

- **Created in 1990**
- **Determine what ICS would look like in the future**
- **Leaders and representatives from most major fire service and Federal agencies**
- ***Model Procedures Guide for Structural Firefighting***

Slide 1-16

Slide 1-17

NATIONAL FIRE ACADEMY

- **Adopted FIRESCOPE ICS in 1980.**
- **The National Fire Academy (NFA) incorporated this material into its training curriculum.**

Slide 1-17

Slide 1-18

FIRESCOPE

Other FIRESCOPE Model ICS applications:

- **Multicasualty**
- **Hazardous materials**
- **Urban Search and Rescue (US&R)**

Slide 1-18

Slide 1-19

FEDERAL EMERGENCY MANAGEMENT AGENCY

- **Formally adopted FIRESCOPE ICS.**
- **FIRESCOPE ICS serves as the IMS for any Federal response.**

Slide 1-19

Slide 1-20

COURSE OVERVIEW

- **Unit 2: Firefighter Fatality and Injury Data**
- **Unit 3: Principles of Risk Management**
- **Unit 4: Safety Responsibilities**
- **Unit 5: Current Issues**
- **Unit 6: Operational Risk Management**
- **Unit 7: Process Application**

Slide 1-20

Slide 1-21

UNIT 2: FIREFIGHTER FATALITY AND INJURY DATA

- **Fatality data**
- **Injury data**
- **Common denominators**
  - **ICS**
  - **PASS**
  - **Communications**
  - **Preincident planning**

Slide 1-21

Slide 1-22

UNIT 3: PRINCIPLES OF RISK MANAGEMENT

- **Risk management model**
- **Low frequency/High risk incidents**
- **Foundation for operational risk management**

Slide 1-22

Slide 1-23

UNIT 4: SAFETY RESPONSIBILITIES

- **ISO**
  - **NFPA 1500**
  - **NFPA 1521**
- **Assistant Safety Officers**

Slide 1-23

Slide 1-24

UNIT 5: CURRENT ISSUES

- **Wildland firefighting**
- **Highway/Traffic safety**
- **Terrorism**
- **Communications**
- **Infection control**
- **Incident scene rehabilitation**

Slide 1-24

Slide 1-25

UNIT 6: OPERATIONAL RISK MANAGEMENT

- **Pre-emergency risk management**
- **Immediate risks**
- **Forecasting**
- **Operational risk management**
- **Termination of operations**

Slide 1-25

Slide 1-26

UNIT 7: PROCESS APPLICATION

- **Putting the process together in order to weave safety into the current fabric of the organization**
- **Course review**

Slide 1-26

Slide 1-27

SUMMARY

- **Any questions on administrative issues.**
- **The students will evaluate the status of their department's ISO program.**
- **"Weave safety into the current fabric of the organization."**

Slide 1-27

UNIT 2: FIREFIGHTER FATALITY AND INJURY DATA

TERMINAL OBJECTIVE

At the conclusion of this unit, the students will be able to describe the impact of a firefighter fatality or serious injury on a fire department.

ENABLING OBJECTIVES

The students will:

1. *Identify the most common causes of firefighter fatalities and injuries.*

2. *Identify common denominators at firefighter fatality incidents.*

INTRODUCTION

The death or serious injury of a firefighter in the line of duty is a failure in the department's health and safety system. In the vast majority of cases, a firefighter death or injury cannot be attributed to a single action or lack of action--it is the failure of the system.

The impact of a firefighter fatality on the firefighter's immediate family cannot be overstated. The emotional stress of losing a loved one is recognized by us all. What often is not known to those outside of the family is the financial hardship, the loneliness after the funeral and tributes are over, and spending a lifetime without the presence of a loved one.

The impact on the fallen firefighter's extended family, his or her fire department, also is severe. Surviving firefighters who were involved in the incident may second-guess their decisions and believe that the firefighter might still be alive if they had done something differently. The Incident Commander (IC) of the fatal incident may feel a sense of personal and professional loss. The stress on the organization can lead to a breakdown in communication between officers and firefighters, the unofficial assignment of blame, and stress in personal and professional relationships among department members.

A severe firefighter injury can have an impact on the firefighter's family and the fire department that is just as serious as the impact of a firefighter death. The injury may require a long period of recovery, the injuries may be severe enough that the firefighter may never fully recover, the firefighter may be forced to retire from the fire service or from his or her nonfire service career (in the case of a volunteer firefighter). Many injuries, although not fatal to the firefighter, have a life-long impact on the quality of life of the firefighter and his or her family, the ability of the firefighter to support his or her family, and the long-term life expectancy of the firefighter.

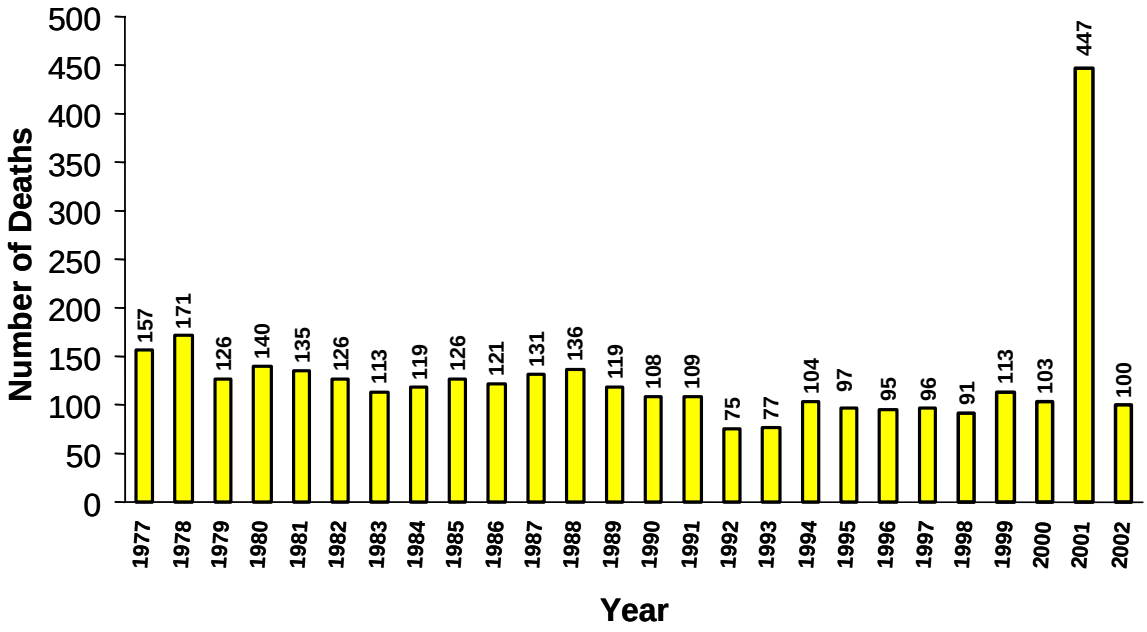
The purpose of this course is to give you the skills that you need to prevent firefighter deaths and injuries.

FIREFIGHTER FATALITIES

Each year, approximately 100 firefighters give their lives in the line of duty. Firefighter fatality statistics for the United States were first systematically tracked in 1977 through a joint effort of the National Fire Protection Association (NFPA) and the United States Fire Administration (USFA). Since 1977, the number of on-duty firefighter fatalities has followed an overall downward trend. The obvious exception to this trend

was the year 2001, when 344 New York City firefighters were killed in the terrorist attacks on the World Trade Center on September 11, 2001.

Table 2-1
On-Duty Firefighter Fatalities (1977-2002)



On-duty firefighter deaths include any death that occurs when the firefighter is on duty. This includes firefighters who die at an emergency incident scene, during training, during fire department functions, and as the result of other accidents or illnesses that strike while the firefighter is on duty. Career firefighters are considered on duty during their scheduled work shifts and volunteer firefighters are considered on duty while participating in any fire department nonemergency function and from the time of alarm until the close of an emergency incident.

A study conducted for the USFA addressed firefighter fatalities that occurred from 1990 through 2000. Results of this study are summarizied in the following paragraphs.

Just under 80 percent of firefighter fatalities occur in association with emergency duties. These duties include response to the incident in the firefighter's personal vehicle or in a fire department vehicle; duties on the emergency scene such as support, ventilation, and fire attack; and returning to the fire station at the conclusion of the incident.

The focus of this course is the function of the Incident Safety Officer (ISO) as a part of the Incident Management System (IMS). The ISO can have a great impact on the safety of firefighters on the scene of an emergency.

Over half of the firefighters who died were volunteers. Career firefighters made up just over a quarter of the firefighters who died. Firefighter fatalities are not a problem that is only present in big cities. The deaths of city firefighters generally get more media attention, but many, many small-town firefighters die each year. Private contactors, prison inmates, and Federal firefighters made up 7.7 percent of the deaths from 1990 to 2000.

Most firefighters die singly. From 1990 through 2000, only 18 incidents occurred where more than two firefighters died. The vast majority of incidents that are fatal to firefighters take the life of only one firefighter.

The largest loss of life during a single incident from 1990 to 2000 was the loss of 14 firefighters in a wildland fire in Colorado on July 6, 1994.

Three hundred and forty-four firefighters died at the World Trade Center (WTC) towers in New York City on September 11, 2001. This is the largest loss of firefighter's lives on any single incident in the history of the United States, and for all of recorded worldwide fire service history. The next highest loss of firefighter's lives in the United States on a single incident was the explosion of two ships in Texas City, Texas, on April 16, 1947. Twenty-seven firefighters were killed. The only other U.S. incident to claim over 20 firefighter's lives was an incident in Chicago on December 22, 1910.[1]

Number of Incidents	Fatalities per Incident	Fatalities	Percent of Firefighter Fatalities
893	1	893	82
59	2	118	11
12	2	24	3
3	4	12	1
2	6	12	1
1	14	14	1
970		1,073	100

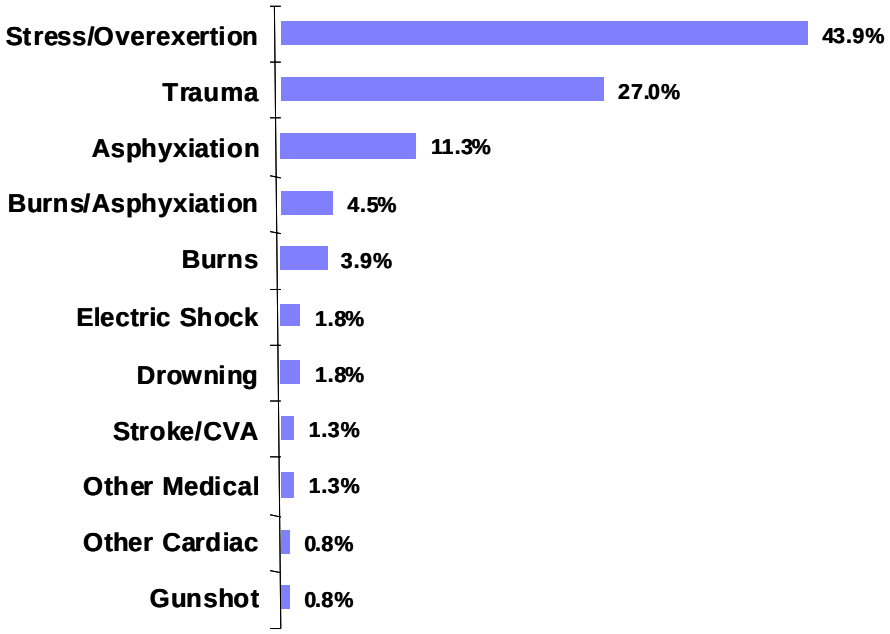
- **Most firefighter deaths occur on the fireground.** From 1990 through 2000, 41.8 percent of all firefighter fatalities occurred as the firefighter was attacking the fire or performing support duties on the fireground.

[1] Hank Przybylowicz, Line of Duty Death Research Service

- The ISO exists to assist the IC with the assurance of the safety of firefighters on the emergency scene.

- **The leading cause of firefighter deaths is heart attacks.** Fourty-four percent of the firefighters who die while on duty are stricken with heart attacks.

Table 2-2
Fatalities by Cause of Fatal Injury 1990-2000



Firefighting is extremely strenuous work and imposes great stress upon the firefighter's respiratory and cardiopulmonary systems. Firefighters die at a higher rate due to heart attacks when compared to occupational categories that have similar periods of downtime followed by intense activity. Firefighters as a group are more likely than other U.S. workers to die of a heart attack while at work.

Occupation	Percent of Deaths Due To Heart Attack
Firefighter	44%
Guards	25%
Police and Detectives	22%
All Occupational Fatalities	15%
Construction Trades	13%
Construction Laborers	10%

The greatest impact on the overall health of a firefighter comes before the emergency. The ISO cannot do much about a firefighter's physical health when the firefighter arrives on the scene. The ISO can help with the management of work/rest cycles at the incident scene and ensure that resources such as rehabilitation and medical support are present when needed at the scene.

Most firefighters who die while on duty are men. From 1990 through 2000, 97.2 percent of the firefighters who died while on duty were men, and 2.8 percent were female.

Traumatic Death and Age

Firefighters under the age of 35 are more likely to be killed by a traumatic injury. Firefighters over age 35 are more likely to succumb to nontraumatic deaths such as heart attacks and cerebrovascular accidents (CVA's).

In approximately 60 percent of the fatalities, the firefighter who died was over 40 years of age; one-third were over 50. Nationally, firefighters over age 50 comprise only 16 percent of the total number of firefighters.

Emergency Medical Services

Although the vast majority of the incidents handled by fire departments are related to emergency medicine, only 3 percent of all firefighter fatalities occur during this type of incident. Traumatic injuries, such as being struck by a vehicle while providing care by the roadside, accounted for 50 percent of these deaths.

MOTOR VEHICLE CRASHES

Motor vehicle crashes account for between 20 and 25 percent of all firefighter fatalities. Of the firefighters who were killed while responding to an emergency, 85 percent were volunteers.

The type of vehicle involved in the most fatal crashes was the firefighter's personal vehicle. After personal vehicles, the type of vehicle involved in the most fatal crashes was aircraft, followed by tankers (tenders), then engine/pumpers.

A recent study of crashes involving tankers performed by the USFA found that seatbelts were not being worn by the firefighter who was killed in 81 percent of the cases.

Although many of the steps that can be taken to prevent firefighter deaths in motor vehicle crashes are implemented by the Health and Safety Officer (HSO), the ISO has a role in their enforcement and followup.

Training Deaths

Approximately 6 percent of all firefighter fatalities occur during training. Most of these deaths occur during physical fitness training and are cardiac related. A significant number of deaths occur during training from smoke inhalation.

The involvement of an ISO at training functions should not be limited to live burn exercises. Although the level of danger is higher when live fire is used, firefighters are killed at a higher rate at equipment drills than at live fire training exercises. Strict observation of the requirements of NFPA 1403, *Standard on Live Fire Training Evolutions,* will provide a higher level of safety during live fire training exercises.

Wildland Firefighters

Wildland firefighters are those firefighters who are employed either full-time or part-time, and have the primary duty of controlling wildland fires. Smokejumpers, the crews of wildland firefighting aircraft, and hand crews are included in this classification.

The study found that very few wildland firefighters died of heart attacks (only 7 percent). The majority of wildland firefighters die of traumatic injuries (58 percent) and burns/asphyxiation (23 percent).

OTHER FACTORS

Fixed Property Use

The highest percentage of firefighter deaths occur in residential occupancies. From 1990 through 2000, 27.7 percent of firefighter fatalities occurred in single-family or multifamily residential structures. However, research by the NFPA has shown that there are actually more firefighter fatalities per fire in commercial structures.

For the ISO, this means that there is no such thing as a "routine" fire. The risk to firefighter's lives is present at **every** emergency incident.

Arson Fires

From 1990 through 2000, 37 percent of the fires that resulted in a firefighter fatality were incendiary or suspicious. The next highest cause of fires fatal to firefighters was electrical distribution.

The ISO at the scene of a arson-caused or suspicious fire must be extremely aware of the extra problems caused by these fires. The buildings may be vacant, the structural integrity may have been deliberately disrupted, and fire progress may be more intense due to the use of accelerants.

Personal Alert Safety System Device Use

From 1990 through 2000, there were 89 cases where the firefighter who died was known to be wearing a personal alert safety system (PASS) device. In 44 percent of these cases, the device did not activate. This usually was due to the fact that the PASS device was not turned on.

Special Firefighter Fatality Research by the National Fire Protection Association

According to research conducted by the NFPA, the rate of firefighter deaths at structure fires has not followed the nationwide downtrend in the number of structure fires. Firefighter deaths at the scene of structure fires have remained constant at about five firefighter deaths per 100,000 structure fires. There are fewer firefighter deaths at structure fires, but there has been no change in the number of firefighter deaths per structure fire since research began in 1977.

The NFPA study also found that the rate of firefighters who die of heart attacks at structure fires has been falling since 1978. Firefighters still die of heart attacks at structure fires in unacceptable numbers, but the number of firefighters who die of heart attacks per structure fire has fallen.

The most unanticipated finding of the NFPA research report on firefighter fatalities in structure fires was that the rate of firefighter deaths **inside** structure fires has risen dramatically. Almost all of the firefighter deaths inside structure fires were the result of smoke inhalation, burns, or crushing injuries. The number of firefighter deaths caused by smoke inhalation has doubled since 1977. Very few firefighter fatalities occur when a firefighter enters a burning structure without a self-contained breathing apparatus (SCBA). In the vast majority of these cases, the firefighter has used an SCBA, but has depleted the unit's air supply.

FIREFIGHTER INJURIES

Each year, tens of thousands of firefighters are injured in the course of their work. According to an NFPA analysis, there were an average of 90,440 firefighter injuries per year from 1992 through 2001.

For the 10 year period ending in 2001, the NFPA data also shows that:

- Over half of all firefighter injuries occur on the fireground. During the period, an average of 46,837 injuries occurred on the fireground each year. The number of fireground injuries per 1,000 fires dropped 11 percent during the period.

- Injuries at nonfire emergencies accounted for 16 percent of the injuries received by firefighters each year. An average of 14,140 firefighters are injured each year at nonfire emergencies.

- There were an average of 14,162 firefighter injuries received each year in vehicle crashes while responding to or retuning from an incident in a fire department vehicle. There were an annual average of 1,416 injuries involving personal vehicle crashes.

- The leading type of injury is strains and sprains, accounting for over one-third of all injuries. Strains, sprains, and muscular pain account for approximately half of all nonfireground injuries. Wounds, cuts, bleeding, and bruises account for approximately 20 percent of all injuries.

- There are over 10,000 exposures to infectious diseases encountered by firefighters. This equates to an average of one exposure per 100 emergency medical services (EMS) responses.

NATIONAL FIRE INCIDENT REPORTING SYSTEM DATA

Another injury report prepared by NFPA using National Fire Incident Reporting System (NFIRS) data looked at firefighter injuries that occurred at the fireground from 1993 to 1997. The research found that 3.2 percent of the total number of fireground injuries are classified as severe or life-threatening. Over one-third of the severe or life-threatening injuries were attributed to asphyxiation or were cardiac in nature.

Fire incident activity and firefighter injury incidents are reported to NFIRS. The NFIRS system is managed by the USFA. All of the data that make the system work come from a network of reporting fire departments across the country.

Some States require incident reporting for fire departments. Many fire departments report their information without a State requirement. The future of fire protection in the United States depends on accurate and timely incident data reporting.

FIREFIGHTER INJURIES AND DEATHS--WHAT HAS CHANGED IN THE PAST DECADE?

Standards are available that provide steps to assure firefighter safety, yet these standards are allegedly unknown or not implemented.

Firefighter protective clothing and equipment is safer and provides a higher level of protection than ever before, yet it may allow firefighters to go deeper into the hazard area and get into trouble.

Some protective equipment is nearly universally used, yet some equipment does not get used when it is provided. A firefighter injury or death due to smoke inhalation as the result of not wearing an SCBA is almost unheard of, yet many firefighters fail to activate their PASS devices.

Firefighters answer many EMS calls and there are few injuries or deaths related to those calls, yet highway incidents pose extreme hazards to firefighters.

The reality of terrorist attacks and the possibility of responding to incidents that involve the use of chemical, biological, radioactive, or nuclear weapons are with the fire service forever.

EXAMPLES OF FIREFIGHTER INJURIES AND FATALITIES

From the National Fire Protection Association Report on U.S. Firefighter Injuries--2001

Michigan

A firefighter sustained a bruised ankle when a nozzle failed while battling a structure fire at an apartment complex. The firefighter was one of five ventilating a pitched roof at the time of injury. The crew placed a charged handline in the roof operations area. The line was fitted with a brass fog nozzle, and charged to a pump pressure of 125 psi. The female swivel was held in place with a setscrew attaching it to body of the nozzle.

Over time, the screw hole elongated and weakened. During firefighting operations, the screw fell out causing the swivel to fail. The resulting nozzle reaction caused the handline to whip, striking the firefighter in the right ankle knocking him onto the roof. Another firefighter grabbed the victim preventing him from falling to the ground below. After being out of work for 13 days and restricted to light duty for 1 week, the firefighter returned to his normal assignment.

New Mexico

On June 11, firefighters responded to a fire in a one-story, wood-frame barn that began when a spark from welding ignited nearby hay. The driver of the department's 1989 tanker/pumper parked it on level ground, applied the parking brake, placed the pump in gear, but failed to place wheel chocks. He then delegated the pumping operation to a 32-year-old colleague. While she was operating the pump, the apparatus slipped out of gear and began rolling forward. The pump operator jumped down from the pump operator's position from the top of the truck and ran alongside the moving apparatus, trying to reach into the cab to shut off the ignition. As she did so, the rolling truck crushed her against a steel fence pole, and continued rolling until another firefighter was able to shut the vehicle off. The injured firefighter suffered a fractured pelvis and musculoskeletal back injuries. She remained hospitalized for 4 months and cannot return to the fire service.

New York

On September 18, two firefighters suffered from carbon monoxide poisoning and oxygen deprivation when they responded to a fire in a commercial occupancy of heavy timber construction. When firefighters arrived, the structure was fully involved with high winds spreading the fire to a nearby building. Together, a Company Officer (CO) and a firefighter searched for victims and fire extension in the building adjacent to the structure of origin. As they searched the second floor, they became disoriented and were unable to locate the stairs. Recent renovations created a mazelike interior, with false windows and limited means of egress. Low air alarms on their SCBA activated. The CO immediately radioed for assistance, and the pair engaged their PASS devices. Due to radio traffic, the IC didn't hear the transmission. Fortunately, another company heard the transmission and relayed the emergency message to Command. A Rapid Intervention Crew (RIC) found the firefighters and moved them to a waiting ambulance that transported them to the hospital where they stayed overnight and were treated in a hyperbaric chamber. Both were out of work for 8 days then returned to full duty.

Washington

On August 6, 2001, the fire department was conducting live fire training in a portable burn trailer. The propane-fueled simulator was trailered to the department for its biannual training. During the last evolution of the evening an explosion occurred, destroying the trailer, injuring two firefighters, and disabling a deputy chief.

A group of four firefighters were participating in the evolution. The objective was to locate and extinguish the fire. As the crew entered the trailer an explosion occurred. One firefighter received a concussion and knee sprain while exiting the trailer. The second firefighter suffers from posttraumatic stress disorder and is under a physician's care. The two other members escaped injury. All members were wearing a full protective ensemble, demonstrating the effectiveness and importance of protective clothing. The deputy chief was inside the trailer's control room. He was not wearing a protective ensemble during the evolutions. When the explosion occurred, a glass panel separating the control room from the burn room shattered striking the deputy chief in the face. The large glass panel was not impact resistant rated for use in a liquid petroleum gas (LPG) environment. The deputy lost his right eye, suffered facial lacerations, and thermal burns. He remained hospitalized for 8 days and was forced to retire from the fire service. Construction defects, a lack of written policies regarding use and maintenance, and absence of safety

devices in the trailer were factors contributing to the firefighters' injuries. Accumulated gases in the trailer ignited when the burners were turned on.

Kansas

A 41-year-old firefighter helping perform an annual hose test was injured when he was hit on the head by a brass coupling as he leaned over a hose to check a leak. He wasn't wearing any protective clothing. The pressurized hose ruptured near the coupling and hit the firefighter in the face, knocking him unconscious and fracturing his skull in two places. He also suffered multiple facial lacerations. He was hospitalized for 6 days and couldn't return to duty for a month. After 8 weeks of rehabilitation and restricted duty, he returned to work.

Examples drawn from the "Firefighter Fatalities in the United States in 2001" report from the U.S. Fire Administration

Pennsylvania

A fire lieutenant responded to a structure fire involving a manufactured home situated on top of a basement. He assisted firefighters operating a hoseline into the basement. When the line was withdrawn from the basement, he helped to reposition the line and then he and another firefighter advanced the line into the interior of the structure at the first floor level.

Conditions in the interior of the structure began to deteriorate, and the decision was made to back out. As the firefighters attempted to exit the structure, they became disoriented due to loops in the hoseline, heavy smoke, and heat conditions. The firefighters got off the line and crawled into a room that had been added to the structure. The firefighters became separated. The firefighter who had been with the lieutenant broke through a window and made it to the outside. When he emerged from the structure, the injured firefighter was transported to the hospital. Unknown to firefighters on the scene, the lieutenant remained in the addition.

A firefighter from another fire department found the lieutenant's helmet and gave it to a chief officer from the lieutenant's fire department. A search for the missing lieutenant was initiated. Firefighters searched the building, and a local hospital was contacted on the chance that the lieutenant had left the scene.

After 30 to 40 minutes of searching, the lieutenant's boots were seen a few feet inside the doorway to the addition. The lieutenant was found bent

backwards over the top of a desk. Firefighters, including the lieutenant's father, removed the lieutenant from the structure. It was determined that the lieutenant had expired.

The lieutenant's air supply had been depleted. He was wearing a PASS device, but it was found to be in the "off" position. Other firefighters had passed the lieutenant's position several times during the search but were unable to see him due to smoke conditions. He carried a portable radio; it was found in a pocket in the "off" position.

The cause of death was listed as asphyxiation due to oxygen depletion within the SCBA.

California

A firefighter and the members of his crew had begun the daily on-duty routine. One of the components of this routine was an exercise program. All three members of the crew began the workout in the fitness area of the fire station. The CO and the other firefighter momentarily left the workout area.

When the firefighter returned to the workout area, the other firefighter was discovered on the floor in a fetal position. The firefighter called to the CO for assistance. An ambulance and an additional engine company were summoned. The CO and the firefighter provided advanced life support (ALS) medical care to the ill firefighter, including the application of a defibrillator.

The ill firefighter was found to be in ventricular fibrillation. A total of 11 shocks were given in the field. Lifesaving efforts continued at the emergency room for another 30 minutes but were unsuccessful. The deceased firefighter was the victim of idiopathic cardiomyopathy (IDC), a heart disease.

Alaska

An assistant chief was the driver of a 1,000-gallon pumper/tanker that was responding to a garage fire. As the apparatus neared the scene, the vehicle began to fishtail. The chief overcorrected as the right rear wheels of the apparatus went off the road. The vehicle traveled into the opposing lane of traffic, and the chief overcorrected again. The apparatus left the right side of the road, rolled onto the driver's side, and collided with a tree. Impact with the tree crushed the cab roof of the apparatus down to the

dashboard and seats. The trunk diameter of the tree was approximately 36 inches.

Responders on the scene of the structure fire witnessed the crash and ran to the scene to render aid. The chief and another firefighter were trapped in the cab. The windshield of the apparatus was removed, and the winch from an electrical utility service truck was used to remove the tree and to pull the roof of the cab open to allow access to the injured firefighters. The chief was removed and found to have a massive head injury. The other firefighter received minor injuries.

CPR was begun on the chief and continued on scene for approximately 20 minutes until he was pronounced dead.

The law enforcement report on the crash cited excessive speed and icy conditions as contributing to the incident. Neither the chief or the passenger in the pumper/tanker was wearing seatbelts.

Michigan

A lieutenant and other members of his department were engaged in search and rescue training using full structural protective clothing, including SCBA. A mannequin was hidden in a room being used for the training, and teams of two firefighters searched for the mannequin while advancing a hoseline. The facepieces of both firefighters were covered with a black hood to reduce visibility.

The lieutenant and his partner searched one room and found no victim, so they moved to the second room. The lieutenant remained by the door as his partner searched. The partner discovered the victim and called to the lieutenant for assistance. The lieutenant stated, "I've got to get out of here" a couple of times and left.

Observers saw the lieutenant rise from the floor, lean on a wall, and attempt to remove his facepiece. Other firefighters assisted the lieutenant by removing his facepiece and loosening his SCBA. The lieutenant took a couple of breaths and collapsed against the wall. Firefighters found that the lieutenant was not breathing and that he had no pulse. Cardiopulmonary resuscitation (CPR) was begun, immediately and medical aid was summoned.

CPR continued and ALS-level medical care was provided. The lieutenant was transported to the hospital but was pronounced dead shortly after his arrival. The cause of death was listed as an acute myocardial infarction due to arteriosclerotic cardiovascular disease.

South Carolina

A firefighter and members of his department were dispatched to a report of a residential structure fire. When firefighters arrived on scene, the patio-style home was well involved, and fire was extending to a second home.

The firefighter relieved another firefighter who had run low on air. He entered an open garage with a charged hoseline and began to apply water to the fire. The garage was situated below the living area above. Five minutes after taking over the handline, the firefighter was knocked to the ground by a partial collapse of the floor/ceiling assembly above the garage. He began to crawl toward the garage door opening with burning debris on top of him. As he neared safety, the remainder of the garage floor/ceiling assembly and the garage door fell on top of him.

The firefighter's SCBA high-pressure line burned through and he was exposed to direct flame contact for over a minute. Other firefighters and civilians on scene came to the firefighter's aid. He was transported to the hospital by a medical helicopter. He suffered second and third degree burns over 50 percent of his body. The firefighter died of complications of his burns almost a month after he was burned.

The fire department was fined $3,250 by the South Carolina State Occupational Safety and Health Administration for work safety violations that occurred at the fire where the firefighter was injured. The major violations included lack of supervision by a commander and lack of communications between the interior and exterior of the hazard zone. A lack of staffing also was cited; 30 minutes into the incident only 5 firefighters were on the scene.

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NOTE-TAKING GUIDE

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UNIT 2:
FIREFIGHTER FATALITY AND INJURY DATA

Slide 2-1

Slide 2-2

TERMINAL OBJECTIVE

At the conclusion of this unit, the students will be able to describe the impact of a firefighter fatality or serious injury on a fire department.

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Slide 2-3

ENABLING OBJECTIVES

The students will:

- **Identify the most common causes of firefighter fatalities and injuries.**
- **Identify common denominators at firefighter fatality incidents.**

Slide 2-3

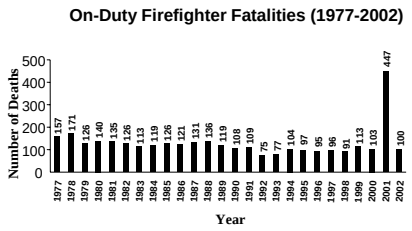
Slide 2-4

INTRODUCTION

- **Firefighter injuries and deaths--a failure in the system**
- **Impact on the family**
- **Impact on the extended family**
- **Severe injuries**

Slide 2-4

Slide 2-5



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Slide 2-6

FIREFIGHTER FATALITIES

- **Approximately 100 per year in the United States**
- **Downward trend since 1977**
- **September 11, 2001--344 New York City firefighters killed**
- **What is considered on duty?**

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Slide 2-7

FIREFIGHTER FATALITY REPORT

1990 through 2000:

- **80 percent of firefighter fatalities associated with emergencies.**
- **Volunteer firefighters.**
- **Most firefighters die singly.**
- **Most firefighter deaths on the fireground.**

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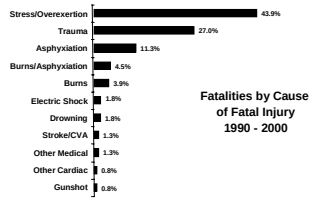
Slide 2-8

CAUSE OF DEATH

Heart attacks kill 44 percent of firefighters



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Slide 2-9

FIREFIGHTER FATALITIES (cont'd)

- **Most firefighters who died were men.**
- **Younger firefighters--trauma.**
- **Older firefighters--stress.**
- **Age and death rates.**

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Slide 2-10

EMERGENCY MEDICAL SERVICES-RELATED DEATHS

- **3 percent of all firefighter fatalities**
- **50 to 70 percent of incidents are emergency medical services (EMS)**
- **Trauma--50 percent of EMS-related deaths**
- **Heart attacks--38 percent of EMS-related deaths**

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Slide 2-11

MOTOR VEHICLE CRASHES

22 percent of firefighter deaths

- **Personally owned vehicles = 26.2 percent**
- **Aircraft = 21.9 percent**
- **Tankers = 19.5 percent**
- **Engines = 13.8 percent**
- **Brush apparatus = 6.7 percent**
- **Ambulances = 5.2 percent**
- **Ladders/Trucks = 3 percent**
- **Other = 2.9 percent**

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MOTOR VEHICLE CRASHES (cont'd)

85 percent of firefighters killed were volunteers.

- **HSO function, generally.**
- **Response policies.**
- **Enforcement.**

Slide 2-12

Slide 2-13

TRAINING DEATHS

- 6 percent of all firefighter fatalities
  - Physical fitness
  - 31 percent trauma
  - 54 percent heart attack
- Incident Safety Officer (ISO) presence
- NFPA 1403
- Medical standby

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Slide 2-14

WILDLAND FIREFIGHTERS

- Only 7 percent of deaths due to heart attacks
- Majority of deaths are traumatic, 58 percent
  - Aircraft crashes, vehicle crashes, tree falls, electrocution
- Burns/Asphyxiation = 23 percent
  - Overrun by fire progress, trapped

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OTHER FACTORS

- Fixed property use
  - Residential
  - Commercial
- Arson fires
- Personal alert safety system (PASS) use

Slide 2-15

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NATIONAL FIRE PROTECTION ASSOCIATION RESEARCH

- **Number of structure fires down.**
- **No change in the rate of firefighter deaths per structure fire.**
- **Heart attack deaths per structure fire down.**
- **Rate of firefighter deaths inside the structure has risen.**

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FIREFIGHTER INJURIES

- **Average of 90,440 from 1992 through 2001**
- **Half of injuries on the fireground**
  - **Rate of injuries per 1,000 fires down**
- **Nonfire emergencies = 16 percent**

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FIREFIGHTER INJURIES (cont'd)

- **Vehicle crashes**
  - **14,162 per year**
  - **1,416 involving personally owned vehicles (POV's)**
- **Strains and sprains = 33 percent of injuries**
- **Cuts, bleeding = 20 percent of injuries**

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FIREFIGHTER INJURIES (cont'd)

- **10,000 infectious disease exposures**
- **Severe or life-threatening injuries**
  - **3.2 percent of all injuries**
  - **33 percent of severe were cardiac or asphyxiation**
  - **National Fire Incident Reporting System (NFIRS) data**

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Slide 2-20

DOCUMENTATION AND RECORDKEEPING

National Fire Incident Reporting System (NFIRS) database

- **Provided by local fire departments**
- **Best available data**
- **Constantly improving**

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Slide 2-21

WHAT HAS CHANGED?

- **Standards**
- **Protective clothing and equipment use and availability**
- **EMS activity and roadside risk**
- **Terrorism**

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Slide 2-22

FIREFIGHTER INJURY AND DEATH INCIDENTS

Short case studies in the Student Manual

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SUMMARY

- **Impact of a firefighter fatality or serious injury**
- **Most common cause of death**
- **The role of the ISO**

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UNIT 3: PRINCIPLES OF RISK MANAGEMENT

TERMINAL OBJECTIVE

At the conclusion of this unit, the students will be able to explain the principles of risk management for the fire service.

ENABLING OBJECTIVES

The students will:

1. *Discuss the classic risk management model.*
2. *Discuss the importance of recognizing low-frequency/high-risk incidents.*
3. *Identify risks to the responders operating at emergency and nonemergency incidents.*

MANAGING RISK VERSUS RISK MANAGEMENT

Risk and the Fire Service

Over the past decade, the fire service has slowly recognized the importance of ensuring the safety, health, and welfare of its firefighters. The fire service is beginning to understand the necessity and rationale for developing, implementing, and maintaining a proactive, comprehensive occupational safety and health program. However, there still are many fire service personnel who do not subscribe to the safety and health philosophy. Tradition plays a major role in this lack of understanding of firefighter safety and health. Although the struggle is far from over, the fire service is learning the lesson that safety is good business.

Firefighter fatality and injury statistics are beginning to remain constant or move downward. This indicates that occupational safety and health is becoming a standard part of fire department operations and activities. However, there still is an incredible amount of work ahead for the fire service regarding occupational safety and health. In years past, the fire service had the distinction of being the most hazardous occupation in the country. Slowly, the fire service is losing this title and is taking pride in conducting safe and effective operations. Firefighter fatality statistics released by the National Fire Protection Association (NFPA) indicate that 100 firefighters died in the line of duty in 2002. This statistical data, which is collected annually, identifies issues that can be addressed through an aggressive occupational safety and health program and strong operational procedures.

Risk Management Process

The fire service has a means of evaluating and controlling or eliminating the hazards that create the inherent risks during the delivery of service, a process known as risk management. Risk management is a very broad and progressive process that has been used successfully by many organizations and businesses for many years.

Risk Management (definition)

The process of planning, organizing, directing, and controlling the resources and activities of an organization in order to minimize detrimental effects on that organization.

--NFPA 1500

This process was introduced formally to the fire service in the 1992 edition of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program.* The intent of incorporating risk management into this Standard was to provide guidance in the development of a comprehensive organizational Risk Management Plan. This Risk Management Plan requires and includes a proactive and functioning occupational safety and health system or program. The focus was to introduce the fire service to both organizational (theoretical) risk management and operational (practical) risk management with emphasis on safety and health. In NFPA 1500, organizational risk management was addressed in the administrative requirements for a fire department and operational risk management was included in the emergency operations section. The organizational risk management process develops a foundation for effectively managing all identifiable risks a fire department encounters on a daily basis including operational risks and hazards.

The effective management of risk is an active, dynamic process, not a single event or a dormant program. The risk management plan establishes a standard of safety for the daily operations of a fire department. This standard of safety establishes the parameters in which we conduct operations during emergency and nonemergency situations. The intent is for all members to operate within this standard level of safety and not to deviate from this process. Control measures are used to ensure the safety and health of departmental personnel.

Risk Management Model

The classic risk management model presents a systematic approach for identifying and planning for the control of risks. This methodical process for making decisions can be used not only for the nonemergency risks that all organizations must address, but also for the risks associated with the response to and mitigation of an emergency incident. The factors at each incident always will vary, but as we have known for years, continual training in all aspects of the approach will yield the best, most consistent results possible.

The model has five primary components, or steps, that serve as a foundation for this process. Each one depends upon information generated by the previous step, so it is important to evaluate each one before moving on to the next. These five steps are discussed in detail in the following sections.

1. Risk identification.
2. Risk evaluation.
3. Establishing priorities or prioritization.

4. Risk control techniques.
5. Monitoring.

For each step in the process, it is important to record performance criteria, suggestions, and recommendations. This data will provide the elements that formulate a written risk management plan. The number of pages in the plan has no impact on effectiveness.

Once created, the plan should be periodically (at least annually) updated. Consider it a dynamic process not a static event with a single written record. Keep the plan current based on conditions, circumstances, and experience.

RISK IDENTIFICATION

What might go wrong? Compile a list of all emergency and nonemergency operations in which the department participates. Ideally, plan for the worst, but hope for the best. There are many sources to assist with this identification process. The first, and possibly the most effective, is the department's loss prevention data. Seek input and ideas from personnel, trade journals, professional associations, and other service providers. When using ideas from other fire departments or organizations, simply consider local circumstances when formulating the list.

RISK EVALUATION

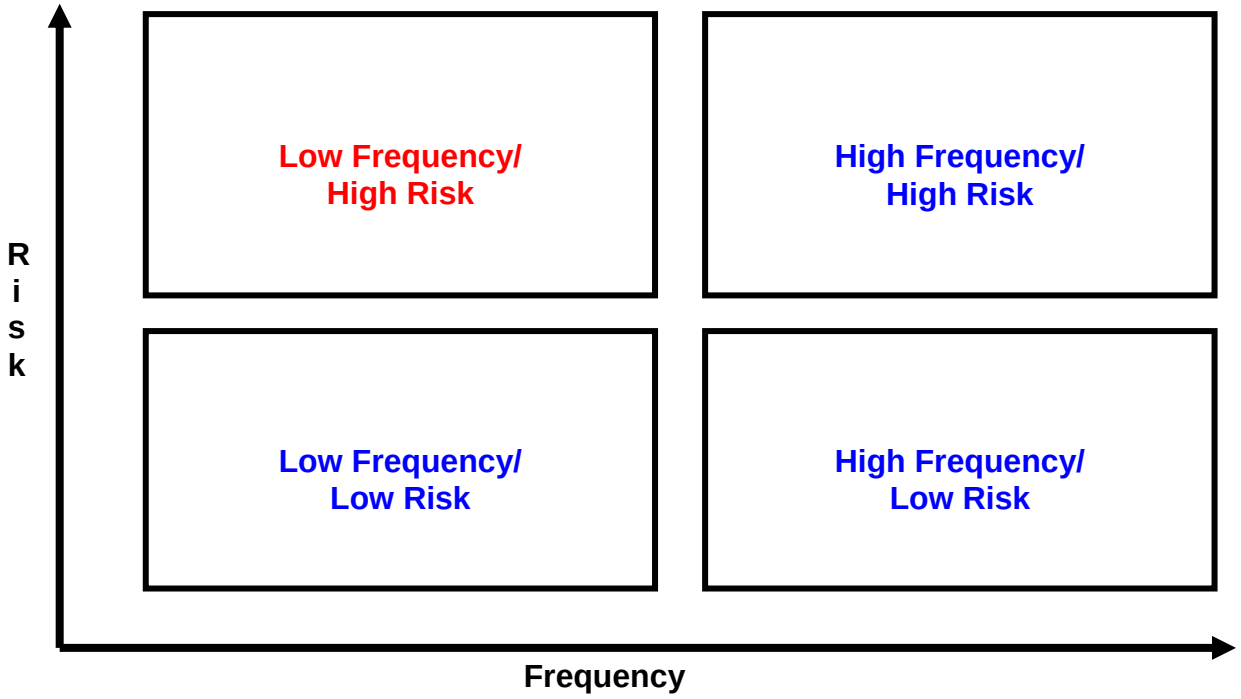
Once the risks are identified, they can be evaluated from the standpoint of both frequency and severity. Frequency addresses the likelihood of occurrence. Typically, if a particular type of incident (e.g., back injuries) has occurred repeatedly, these incidents will continue to occur until effective control measures are implemented.

Severity addresses the degree of seriousness of the incident. This can be measured in a variety of ways such as time away from work; cost of damage; cost of, and time, for repair or replacement; disruption of service; or legal costs. Using the information gathered in the identification step, the risks can be classified based on severity.

ESTABLISHING PRIORITIES

Taken in combination, the results of the frequency and severity determinations will help to establish priorities for determining action. Any risk that has a low probability of occurrence, but will have serious consequences (high risk or severity), deserves immediate action and would be considered a high priority item. Nonserious incidents with a low likelihood of occurrence are a lower priority and can be placed near the bottom of the "action required" list.

Table 3-1
XY Graph for Prioritizing Risk



RISK CONTROL TECHNIQUES

At this point in the process, risks have been identified and evaluated, so it is time to find solutions. There are several approaches to take, including risk avoidance, implementation of control measures, and risk transfer.

In any situation, the best choice is risk avoidance. Simply put, this means avoid the activity that creates the risk. In an emergency services organization, this frequently is impractical. Lifting a stretcher presents a serious back injury risk, but you cannot avoid this risk and still provide effective service.

An example of where avoidance has been very practical is the widespread, hopefully universal, use of sharps containers. The risks associated with recapping needles are well documented; therefore, recapping is no longer an accepted practice. This risky behavior can be avoided through the proper use of a sharps container.

The most common method used for the management of risk is the adoption of effective control measures. While control measures will not eliminate the risk, they can reduce the likelihood of occurrence or mitigate the severity. Safety programs, ongoing training and education programs, and well-defined Standard Operating Procedures (SOP's) are all effective control measures.

Some typical control measures instituted to control fireground injuries include accountability, use of full protective clothing, a mandatory respiratory protection program, training and education, and competent SOP's. These control measures coupled together make an effective program that ensures safe fireground operations.

Risk transfer can be accomplished in two primary ways: physically transferring the risk to somebody else or through the purchase of insurance. For a fire or emergency medical services (EMS) organization, the transfer of risk may be difficult if not impossible. However, an example of risk transfer would be contracting out the operation and maintenance of helicopters for use by responders. The risks associated with those activities have been transferred to a private contractor.

The purchase of insurance transfers financial risk only. In addition, it does nothing to affect the likelihood of occurrence. Buying fire insurance on a fire station, while highly recommended to protect the assets of the department, does nothing to prevent the station from burning down. Therefore, insurance is no substitute for effective control measures.

RISK MONITORING

The last step in the process is risk management monitoring. Once control measures have been implemented, they need to be evaluated to measure their effectiveness. Any problems that occur in the process have to be revised or modified. This final step ensures that the system is dynamic and will facilitate periodic reviews of the entire program.

The intent of the risk management plan is to develop a strategy for reducing the inherent risks associated with fire department operations. Regardless of the size or type of fire department, every organization should operate within the parameters of a Risk Management Plan. This is a dynamic and aggressive process that must be monitored and revised annually by the Health and Safety Officer (HSO).

PRE-EMERGENCY RISK MANAGEMENT

What Is Pre-Emergency Risk Management?

Pre-emergency risk management uses the classic risk management model approach. Risks, real or perceived, that can be at least partially managed in advance, are identified. This is the process that occurs prior to the response to emergencies, but which will make emergency scene risk management easier to perform. Pre-emergency risks are those that fit between the nonemergency risks and the risks presented at an emergency incident.

The pre-emergency risk management elements must be identified and managed in order for an organization to conduct emergency operations safely and effectively. Therefore, pre-emergency risk management can be defined as "a process that utilizes key safety and health elements, prior to response, that will reduced risks involved during emergency operations and enhance customer service."

Necessary Components of Pre-Emergency Risk Management

Three initial components must be in place to establish a pre-emergency risk management plan:

1. Written Risk Management Plan.
2. Written Occupational Safety and Health Program.
3. Risk Management Toolbox.

Each will affect the daily operations of the organization based upon local factors such as philosophy, implementation, and management. Each of these pre-emergency risk management components will be expanded in further detail so they can be understood and recognized clearly for the importance they play in the overall risk management process.

For many organizations, the component least likely to be in place already is the written Risk Management Plan. Most organizations have used a written safety and health program for years and use an HSO to oversee the safety and health process. It does not hurt, however, to evaluate each of these functions and amend them to improve the safety and health of the organization.

Written Risk Management Plan

Risks are identified and evaluated, priorities determined, and control measures established. At this point, the process for handling pre-emergency risks is initiated.

A written Risk Management Plan will be the result of a process that includes a review of the organization's policy and procedures. By formulating this plan, the organization is taking steps to avoid or control the risks, which also will help to protect against liability. The resulting plan will define how tasks, functions, or operations can be conducted in the safest manner possible. In the formation of this plan, the following functions must be considered from a risk analysis standpoint:

- administration;
- facilities;
- training;
- vehicle operations;
- personal protective equipment (PPE);
- operations at emergency incidents;
- operations at nonemergency incidents; and
- other related activities.

Written Occupational Safety and Health Program

The safety, health, and welfare of personnel is one of the, if not the, most important responsibility for a fire chief, or other top administrator, in the operation of an organization. The lack of personnel who may be out due to occupational injuries or illnesses disrupts the operation of the organization, and will have effects that are both financial and moral.

The safety and health program outlines procedures for department personnel that, if followed, will enable them to perform their daily duties and responsibilities in a safe and effective manner. An effective written program places the responsibility and authority for safety on all personnel, and holds supervisors accountable for ensuring that personnel understand and comply with the requirements of this program.

There is no set method for developing a safety and health policy. The policy may be a single affirmation or may be part of a SOP manual. Whatever method is used, all personnel must be provided with training and familiarization so they understand the intent and concept of this policy. Unfortunately, many policies written by an organization are placed in binders, put on a shelf, never to be seen again. If this happens to the safety and health policy, it will lead to a lack of compliance by personnel, lack of support by supervisors, and general apathy.

NFPA 1500 states that an organization shall implement written safety and health procedures that provide definitive measures for preventing and eliminating occupational accidents, injuries, illnesses, and fatalities. This policy requires that the organization's safety and health program meet the requirements of NFPA 1500.

An integral part of any safety and health program, or effort, is the statement of safety policy adopted by the leaders of the organization. A sample is included in NFPA 1500, which is very simple, yet concise. Regardless of the size of an organization, this policy statement could work very well.

Risk Management Toolbox

Within the pre-emergency risk management process, there are additional components that must be included in the process. Several tools are needed in order to establish an effective risk management program. Put all of these tools together and the necessary components fit into the control measures area of the risk management toolbox. Each component is a key element and, combined with the other components, produces an effective and safe department operation.

The components of the toolbox are

- SOP's,
- effective training;
- personal protective clothing and equipment;
- apparatus and equipment;
- Incident Command System (ICS); and
- a personnel accountability system.

The risks that firefighters encounter, or potential risks that may be confronted, must be identified. These risks are evaluated from the standpoint of frequency and severity or likelihood of occurrence. Prioritize the risks based on past occurrences, accident and injury statistics, safety audit, and other components. Then control measures are developed. Based

upon these data, identify several vital components for the pre-emergency process that must be in place in order to make the program accountable, productive, and practical.

Standard Operating Procedures

SOP's are written policies developed by an organization that define exact methods or activities performed by its members. These procedures affect only the operation of the organization that writes and adopts them. The requirements of these procedures must be based on recognized laws and regulations, which must meet or exceed the requirements. SOP's are the foundation from which an organization functions on a daily basis. They must cover all fire organizational operations--both emergency and nonemergency.

The basis of the SOP's is quite simple, though we tend to make it more difficult than we have to at times. As they are developed and written, a training process must take place in order for personnel to understand what is expected of them. Once the SOP's become effective, they become enforceable. Once the training and education process has been completed, there is no excuse for noncompliance. The development of a SOP for interior structural firefighting mandates personnel shall wear full protective clothing and equipment including self-contained breathing apparatus (SCBA) and facepiece, yet the fire service struggles at times with compliance.

As departments or organizations use SOP's, there must be a process for reviewing and amending them. This process needs to identify the effectiveness of the SOP's--are they being used, and if so, are they being followed. If they are not being followed, change them or delete them from the SOP's manual. SOP's that are on the shelf for the sake of being on the shelf can come back to torment an organization. This is why it is very important to have a systematic process to review the SOP's on a regularly scheduled basis.

Effective Training

Without an effective training program a department would be liable for allowing members to function at an emergency without training and certification. From a pre-emergency risk management standpoint, this component is vital for ensuring consistency, efficiency, and safety. Without training, the fireground would be nothing more than an out-of-control mess.

The training process is an avenue for testing and evaluating new or revised SOP's or policies. Training is also the approach for instituting and enforcing the safety process in a nonemergency mode or setting.

Personal Protective Clothing and Equipment

Prior to participating in any emergency operation, an organization must define what is the minimum level of protective clothing necessary to conduct business. This includes structural firefighting, vehicles, wildlands, or any other type of firefighting operation, hazardous materials incidents, special operations, emergency medical services, or any other activity that requires the use of protective clothing and equipment. The organization has the obligation to ensure that the equipment provided is compliant and meets the intent for which it will be used. A key component is that personnel understand the use and limitations of the respective protective clothing. These garments and equipment are tested per certain criteria standards, which means they have a limitation and will fail once that limitation (a defined temperature) is reached. The protective clothing has built-in safety factors, but they will provide protection for a very short period of time. The maintenance and care of protective clothing is important as well to the safety of the wearer. Poorly maintained protective clothing and equipment leads to accidents and injuries. The manufacturer's recommendations should be followed with respect to cleaning and repairing these garments and equipment.

Apparatus and Equipment

The apparatus and equipment that is used for emergency operations must be properly equipped and properly maintained to maximize the safety of personnel. In order for this process to be productive, at least two components must be in place: a preventive maintenance program and a response SOP for "emergency driving" of apparatus.

The preventive maintenance program will ensure that routine maintenance and repairs are performed on apparatus on a scheduled basis. There will be criteria in place that allow apparatus to be placed out of service if certain conditions exist (e.g., poor brakes). Maintenance and repairs performed on the apparatus must be done or completed by certified mechanics.

Incident Command System

The command and control of an incident is the key to an effective, efficient, and safe operation. The risks are too great to allow the incident to be managed in an aimless and chaotic manner. Through SOP's, an organization must provide a system that effectively manages an incident using such elements as essential decisionmaking, tactical design, plan survey and modification, and command and control. The ICS needs to be flexible, yet solid enough to function at:

- fires;
- hazardous materials incidents;
- aircraft emergencies;
- highrise incidents;
- special operations--water, high angle, trench, and confined space rescue;
- EMS incidents--mass casualty, multivictim; and
- any other emergency that requires the implementation of an ICS.

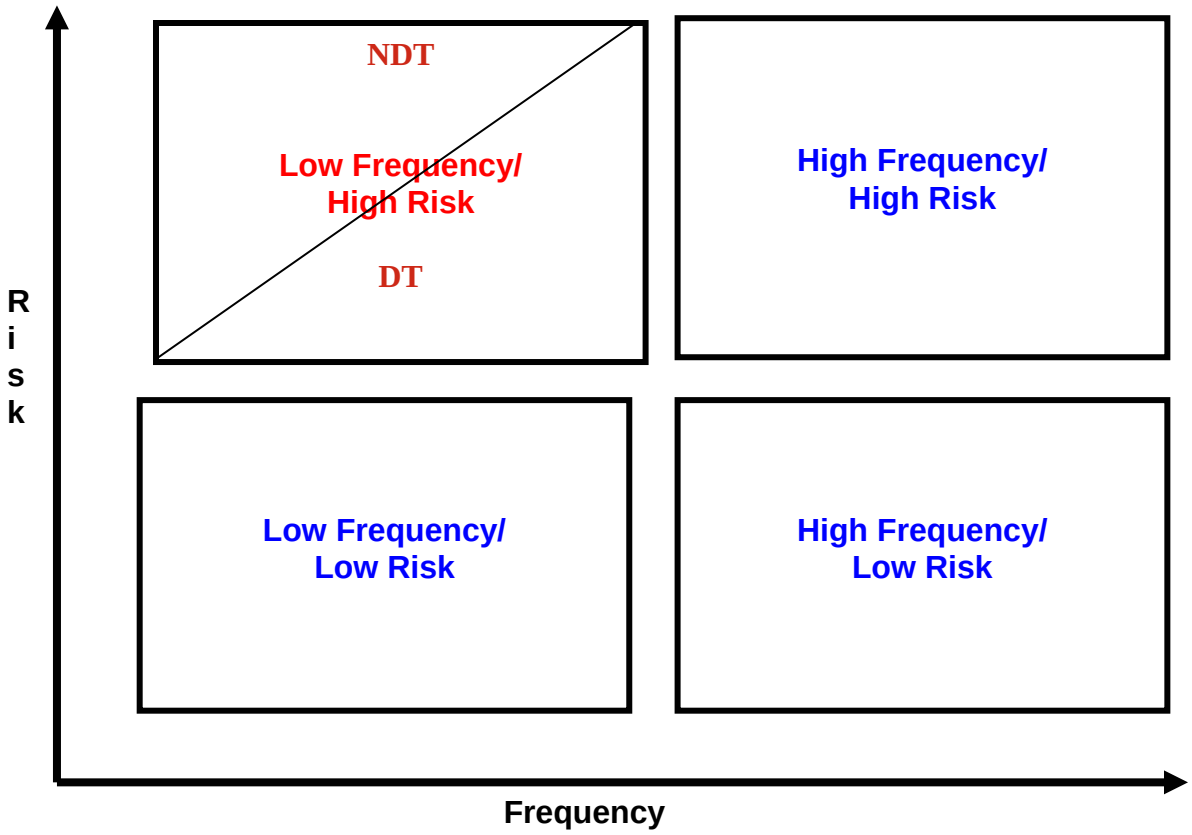
Personnel Accountability System

The management of an incident scene, maintaining the accountability of personnel is a crucial function of the Incident Commander (IC). Being able to account for the location of each member at an emergency incident is imperative in the event a problem develops that requires the tracking of all personnel on scene. In the past through the ICS, we have tried to control the accountability of personnel, but freelancing still exists. A personnel accountability system will not be successful unless all personnel buy into the program. A written personnel accountability system will not be effective unless personnel are trained in the process, use the procedures, and are held accountable for noncompliance. From a risk management perspective, the personnel accountability system is an excellent control measure.

RECOGNITION-PRIMED DECISIONMAKING

Gordon Graham, a California risk management consultant, has added a new twist to the time honored frequency/severity matrix. He maintains that high frequency events, whether low risk or high risk, are managed correctly most of the time since responders have seen this type of situation before and know what to do. More problems and danger are presented to responders in low frequency events, since they have little or no experience base to call upon.

Table 3-1
XY Graph Showing Discretionary Time in the Low Frequency/High Risk Quadrant



He explains that people have a "hard drive" inside their head. Life and professional experiences are stored on the hard drive. Each time we have an experience, information about what worked and what did not work is loaded onto the hard drive. When we are presented with a situation, such as a structure fire, we unconsciously take what we see and attempt to match it with situations that we have seen before, situations that are stored on our hard drive. If we have a match, we take the information that we have stored about what works and what does not work and attempt to apply it to the present situation. In the vast majority of high frequency events, our past experience helps us manage the situation.

Mr. Graham is discussing a concept called **Naturalistic Decisionmaking** (NDM). This concept (formerly termed **Recognition-Primed Decisionmaking**) evolved from military research in the 1980's. The military found that experienced battlefield commanders quickly analyzed a small number of variables when presented with a situation. The commander used the outcome of this rapid analysis to make decisions on what should be done, based on the "hard drive" in his head.

NDM can be used to train firefighters for infrequent high-risk situations by regularly presenting these situations in training. As the situations are managed in training situations, the experience becomes a part of the "hard drive." When the event happens, the firefighter recalls the training in the same manner that previous experiences with high frequency situations would be recalled. NDM used in training can better prepare emergency responders to work safely.

In fire and emergency services, things are not always what they seem to be. A danger exists if we view **all** similar situations as if they are the same. There are situations where what worked fine the last time does not work well in the present emergency. That "failure," or learning event, expands the base of knowledge within our hard drives. For example, many fire departments are dealing with the need to convert a "residential" fire mentality that is unconsciously applied to all structural fire events. If a set of tactics that worked well for fighting 30 residential fires is applied to a fire in a commercial structure, the results may not be the same.

Mr. Graham adds another component to the upper left box in the frequency/severity matrix--**discretionary time**. In high-risk, low-frequency situations where responders have the benefit of time, such as a hazardous materials incident with no immediate life threat, there is the opportunity to back away from the hazard. The extra time affords responders the ability to research alternatives, call in technical experts, or use regional resources to address the problem. High-risk, low-frequency situations where there is no time to back off and make decisions pose the most extreme levels of risk to responders and response organizations. Responders are handicapped in these situations both by very little information and by very little time.

Graham's risk management concepts can be applied to nonemergency and pre-emergency risk management as well as they can be applied to emergency situations.

SUMMARY

For the risk management efforts to be successful, a process must be developed and **all** members of the department understand the concept and philosophy. Problem identification often requires considerable fact-finding and information-gathering activities. The goal of the risk management process is to provide for the safety, health, and welfare of the members of the organization. To be successful, it is important that organizational members understand and feel that they are valuable contributors to the risk management process--as opposed to feeling the process is being forced upon them.

Activity 3.1

Risk Management Plan for a Specific Risk

Purpose

To identify, evaluate, and provide control measures for risks associated with emergency and nonemergency functions of a fire department.

Directions

1. In this small group activity, you will identify the risks associated with the function assigned to your group. These risks should be identified in the assigned column of the following Student Activity Worksheet (SAW).

2. After your group has identified the risks, evaluate those risks and provide the necessary control measure(s) needed to ensure for the safety of members operating at the scenario shown.

3. Your group will have 10 minutes to complete this activity. A general discussion will be held to discuss the class findings.

Activity 3.1 (cont'd)

Worksheet

Scenario 1: Highway/Traffic incident involving fire department apparatus

Risks:

_____
_____
_____

Evaluation:

_____
_____
_____

Control Measure(s):

_____
_____
_____

Scenario 2: Technical rescue

Risks:

_____
_____
_____

Evaluation:

_____
_____
_____

Control Measure(s):

_____
_____
_____

Scenario 3: Overturned tanker--hazardous materials incident

Risks:

_____
_____
_____

Evaluation:

_____
_____
_____

Control Measure(s):

_____
_____
_____

Scenario 4: Commercial structure fire

Risks:

_____
_____
_____

Evaluation:

_____
_____
_____

Control Measure(s):

_____
_____
_____

Scenario 5: Vehicle accident

Risks:

_____
_____
_____

Evaluation:

_____
_____
_____

Control Measure(s):

_____
_____
_____

Scenario 6: Backing accident involving fire department vehicle

Risks:

_____
_____
_____

Evaluation:

_____
_____
_____

Control Measure(s):

_____
_____
_____

Scenario 7: Vehicle crash involving fire department vehicle

Risks:

_____
_____
_____

Evaluation:

_____
_____
_____

Control Measure(s):

_____
_____
_____

Scenario 8: Vehicle accident involving propane truck

Risks:

_____
_____
_____

Evaluation:

_____
_____
_____

Control Measure(s):

_____
_____
_____

NOTE-TAKING GUIDE

Slide 3-1

UNIT 3:
PRINCIPLES OF RISK MANAGEMENT

Slide 3-1

Slide 3-2

TERMINAL OBJECTIVE

At the conclusion of this unit, the students will be able to explain the principles of risk management for the fire service.

Slide 3-2

Slide 3-3

ENABLING OBJECTIVES

The students will:

- **Discuss the classic risk management model.**
- **Discuss the importance of recognizing low-frequency/high-risk incidents.**
- **Identify the risks to responders operating at emergency and nonemergency incidents.**

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Slide 3-4

RISK AND THE FIRE SERVICE

Define Risk

Slide 3-4

Slide 3-5

RISK MANAGEMENT PROCESS

Definition of risk management: The process of planning, organizing, directing, and controlling the resources and activities of an organization in order to minimize detrimental effects on that organization

--NFPA 1500

Slide 3-5

Slide 3-6

RISK MANAGEMENT PROCESS (cont'd)

- **Primary focus of organizational risk management is firefighter safety and health.**
- **Nonemergency risk management--hazards common to all work places.**
- **Pre-emergency risk management--activities that take place prior to emergency incidents.**
- **Emergency risk management--duty of every responder.**

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Slide 3-7

RISK MANAGEMENT MODEL

- **Risk identification**
- **Risk evaluation**
- **Risk prioritization**
- **Risk control measures**
- **Risk monitoring**

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Slide 3-8

RISK IDENTIFICATION

- **Identify risks that are inherent to the fire service**
- **Identify risks inherent in your own fire department**
- **Any similarities?**
- **Starts the risk identification process**

Slide 3-8

Slide 3-9

RISK EVALUATION

Determining which risks will be controlled first

- **XY Graph; frequency and risk (severity)**
  - **Frequency--how often does the risk occur?**
  - **Risk (severity)--how severe are the consequences if things go wrong?**
- **Accident and injury data**
- **Incident reporting system**

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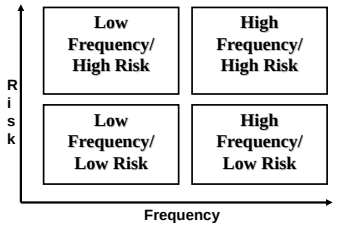
Slide 3-10

XY GRAPH



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Slide 3-11

MATRIX

Matrix (graph) may help in classifying problems.

- **High frequency/High risk example--single family (residential) structure fires.**
- **Low frequency/High risk example--commercial structure fires.**

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Slide 3-12

ESTABLISHING PRIORITIES

- **Decision as to which risks will be controlled first.**
- **Low frequency/High risk.**
- **Difficult decision--Based on analysis by risk managers, Health and Safety Officer (HSO), Occupational Safety and Health Committee.**
- **There is no absolutely correct priority order.**
- **Matrix may help in classifying problems.**

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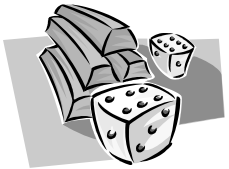
Slide 3-13

RISK CONTROL TECHNIQUES

- **Avoidance (e.g., not letting families ride in fire department vehicles, such as an ambulance)**
- **Transfer (insurance transfers risk to someone else)**



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RISK CONTROL TECNIQUES (cont'd)

- **Control measures**
  - **Use of personal protective equipment (PPE), self-contained breathing apparatus (SCBA)**
  - **Incident Command System (ICS)**
  - **Personnel accountability system**
  - **Training and education**
- **Process used by the fire service**

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Slide 3-15

RISK MONITORING

- **Process conducted 9 to 12 months after initiation of Risk Management Plan**
- **Analysis of accident and injury data**
- **Any occurrence of significant incidents**
  - **Fatality**
  - **Serious injury**
  - **Apparatus accident**

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RISK MONITORING (cont'd)

- **Internal analysis**
- **Review with risk management division**
- **Every 3 years an independent evaluation**

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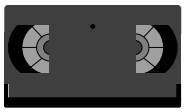
VIDEO:

"Gordon Graham on Risk Management"



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PRE-EMERGENCY RISK MANAGEMENT

- **Real or perceived**
- **Defined as a process that uses key safety and health elements, prior to response, that will reduce the risks during emergency operations**

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PRE-EMERGENCY RISK MANAGEMENT (cont'd)

Written Risk Management Plan
- **Complies with NFPA 1500**
- **Example provided in the Annex of NFPA 1500**
- **Responsibility of the HSO, which affects the operations at an emergency incident**

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Slide 3-20

RISK MANAGEMENT PLAN

Components:
- **Administration**
- **Facilities**
- **Training**
- **Vehicle Operation**
- **PPE**
- **Emergency Operations**
- **Operations at nonemergency incidents**

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OCCUPATIONAL SAFETY AND HEALTH PROGRAM

- **Written Standard Operating Procedure (SOP) or policy**
- **Complies with NFPA 1500**
- **Based upon the department's mission statement**

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RISK MANAGEMENT TOOLBOX

- **SOP's**
- **Training and education**
- **PPE**
- **Apparatus and equipment**
- **ICS**
- **Personnel accountability system**

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Slide 3-23

RECOGNITION-PRIMED DECISIONMAKING

- **Naturalistic decisionmaking**
- **Discretionary time**
- **Nondiscretionary time**

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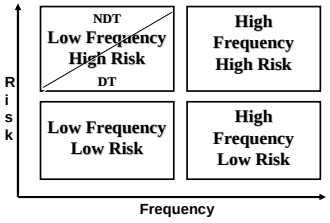
RECOGNITION-PRIMED DECISIONMAKING (cont'd)



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Slide 3-25

SUMMARY

- **Risk management for the purposes of this course focuses on firefighter safety.**
- **Risk management is a process.**
- **Risk management is a critical component of incident scene safety and must be integrated into every emergency incident.**

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Activity 3.1
Risk Management Plan for a Specific Risk

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SCENARIO 1

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SCENARIO 2

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SCENARIO 3

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SCENARIO 4

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SCENARIO 5

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SCENARIO 6

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Slide 3-33

SCENARIO 7

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SCENARIO 8

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UNIT 4: SAFETY RESPONSIBILITIES

TERMINAL OBJECTIVE

At the conclusion of this unit, the students will be able to describe the safety role of all responders operating within the Incident Command System (ICS).

ENABLING OBJECTIVES

The students will:

1. *Describe the safety responsibilities outlined in National Fire Protection Association (NFPA) 1500,* Standard on Fire Department Occupational Safety and Health Program *and NFPA 1521,* Standard for Fire Department Safety Officer.

2. *Describe how the roles of the Incident Commander (IC), Health and Safety Officer (HSO), and Incident Safety Officer (ISO) interrelate.*

3. *Describe the components of the Incident Action Plan (IAP) and the Safety IAP.*

4. *Develop a Safety IAP for a specific incident.*

INTRODUCTION

The safety of everyone on the scene of an emergency incident is the ultimate responsibility of the Incident Commander (IC). This responsibility cannot be delegated. The Incident Command System (ICS), the Health and Safety Officer (HSO), the Incident Safety Officer (ISO), the Incident Action Plan (IAP), and the Safety IAP are components of the fire department's occupational safety and health program that assist the IC with this awesome burden.

Everyone on an incident scene has some safety responsibility. Firefighters are required to work with their Company Officers (CO's). CO's work under the control of the IC or another chief officer and watch over those assigned to them, and all responders at the scene work within the ICS. The coordinated effort of everyone on the scene assures that firefighters work within a scene that is properly managed from the safety perspective.

This unit will discuss the safety responsibilities that are included in NFPA 1500, S*tandard on Fire Department Occupational Safety and Health Program* and NFPA 1521, *Standard for Fire Department Safety Officer*.

This unit also will discuss the importance of the IAP and the development and implementation of a Safety IAP.

INCIDENT COMMANDER

The IC's focus is on strategic issues, comprehensive strategic planning, forecasting, and developing priorities for the incident. He/She must employ risk management principles that are supported by all personnel. The IC evaluates the acceptable levels of risk in relationship to saving lives and property and protecting the lives of personnel. He/She then uses effective strategies and justifiable tactical operations to minimize risks that cannot be eliminated completely.

The Incident Commander and the Incident Safety Officer

The IC has overall responsibility for the safety of responders working at an emergency scene. That responsibility cannot be delegated. The ISO assists the IC and acts as the IC's eyes and ears on matters related to safety. The appointment of an ISO should be a common practice to ensure that this function is used properly.

The ISO reports directly to the IC as a part of an ICS. Direct access to the IC allows the ISO to transmit his/her information directly without the message becoming scrambled in transmission. This relationship reflects the importance of the ISO's role at the emergency scene.

INCIDENT ACTION PLAN

The IAP defines the strategic goals, tactical objectives, risk management, member safety, and supporting requirements for an incident. For small or simple incidents, such as a room-and-contents fire, the IAP normally is relayed verbally. For large or complex incidents, such as a hazardous materials incident that lasts for 10 hours, the IAP usually is in written form. However, the IC may require a written IAP for any incident. The IC has the overall **responsibility** for developing and maintaining the IAP throughout the incident. The Planning Section actually develops the plan with input from the appropriate sections, including the ISO.

SAFETY RESPONSIBILITIES

The incorporation of occupational safety and health in the fire service over the past 25 years has resulted in significant improvement in the safety and welfare of firefighters. Although each member shares the responsibility for ensuring cooperation, participation, and compliance with the provisions of the department's occupational safety and health program, certain members have definitive roles.

Fire Chief

The fire chief is responsible for ensuring the safety, health, and welfare of all members of the department. This is accomplished using a variety of methods, including a Risk Management Plan and an occupational safety and health program. These are comprehensive programs, which cover all aspects of the department's activities, both emergency and nonemergency.

The fire chief defines the standard level of safety for the organization; therefore, he/she must be committed to safety and health and take a proactive approach to the occupational safety and health program. Methods of implementing the program include

- appointment of an HSO to manage the occupational safety and health program;
- financial support;

- provide necessary staffing;
- training and education; and
- clear, concise communications.

HEALTH AND SAFETY OFFICER

Over the past 20 years, a great deal of positive change has come about in the fire service. Vast improvements have been made in the advancement of firefighter safety and health. One of these changes has been the creation and development of the functions of an HSO (known in some NFPA publications as the fire department Safety Officer). This position has evolved into a very demanding and responsible position for the person designated for this role.

According to NFPA 1500, every fire department, regardless of size, must have an individual assigned to the duties of HSO. The HSO is appointed by the fire chief and reports directly to the fire chief or designee. An HSO also is strongly recommended for other emergency response organizations, such as in emergency medical services (EMS) departments.

The HSO is responsible for developing, coordinating, and managing the occupational safety and health program for the department.

Definition of Health and Safety Officer

NFPA 1500 defines the HSO as the member of the fire department assigned and authorized by the fire chief as the manager of the safety and health program.

NFPA 1521 defines the HSO as the member of the fire department assigned and authorized by the fire chief as the manager of the safety and health program and who performs the duties and responsibilities specified in NFPA 1521. The definition goes on to say that the HSO can also be the ISO, or the duties of the ISO can be a separate function.

In either case, the HSO is a department-level, primarily administrative position, responsible for coordination of safety and wellness aspects as they apply to organizational activities.

The HSO guides departmental policy as it applies to occupational safety practices and member welfare issues. The HSO is responsible for interpretation of rules, regulations, and standards and their application as they relate to organizational activities.

According to NFPA 1521, the HSO must be an officer within the agency. He or she must be trained to NFPA Fire Officer Level I according to the requirements of NFPA 1021, *Standard for Fire Officer Professional Qualifications*. All Safety Officers, including the HSO, must have a knowledge of:

- firefighting and its hazards;
- rules and regulations that affect fire department operations, such as NFPA Standards;
- department Standard Operating Procedures (SOP's);
- safety management; and
- physical fitness.

Although the majority of the HSO's activities are performed in a nonemergency setting, this work has a major impact on emergency operations. He/She also may act as an ISO and provide safety supervision on emergency scenes.

The HSO has a number of responsibilities. These duties are outlined in both NFPA 1521 and NFPA 1500.

Some of the major duties of an HSO are

- Be involved in the development, implementation, and management of the department's Risk Management Plan. The HSO also is responsible for the communication of the plan to all members through training and education and to make copies of the plan available to all members.

- Monitor the effectiveness of the Risk Management Plan and ensure that the plan is revised annually.

- Develop an incident Risk Management Plan that is implemented into the department's ICS.

- Develop, revise, and review rules, regulations, and SOP's to ensure compliance with applicable laws, codes, and standards regarding firefighter health and safety. Assess the adequacy of the department's SOP's as they relate to firefighter health and safety.

- Develop SOP's for high-risk activities such as emergency driving, wildland and structural firefighting, and the use of protective clothing and equipment such as self-contained breathing apparatus (SCBA).

- Ensure that safety training is provided to all members and that safety is integrated into all training. Assure that safety supervision is provided for training activities. The HSO or qualified designee must participate in the preparation for live fire training in acquired structures according to NFPA 1403, *Standard on Live Fire Training Evolutions*.

- Manage an accident prevention program that provides instruction on safe work practices for emergency and nonemergency activities, driver training and testing, and periodic safety surveys of all fire department activities.

- Manage an accident investigation program to address all occupational injuries, illnesses, exposures, and fatalities. Develop corrective recommendations for the fire chief and assure that training is provided to members with lessons learned from previous accidents.

- Ensure that records are maintained on all accidents, occupational deaths, injuries, illnesses, and exposures. Manage the collection and analysis of these records. Maintain records for specific safety inspections such as periodic testing of fire apparatus and equipment. Prepare an annual report for the fire chief on fire department accidents, occupational injuries, illnesses, deaths, and exposures.

- Review the specifications for new apparatus, equipment, protective clothing, and protective equipment to ensure compliance with safety standards. Make recommendations on the evaluation of new equipment.

- Make recommendations on the service testing of apparatus and equipment.

- Develop, implement, and maintain a protective clothing and equipment program. Provide for a periodic inspection and evaluation of all protective clothing and equipment to ensure serviceability.

- Ensure that fire department facilities are inspected and that safety and health hazards are corrected promptly.

- Ensure that a health maintenance program is operational, including medical surveillance, wellness programs, physical fitness, nutrition, and rehab.

- Assure that the department has an Occupational Safety and Health Committee and that the committee meets NFPA 1500 requirements. Maintain membership in the department's Occupational Safety and Health Committee. Report on the recommendations of the committee to the fire chief.

- Assist fire companies in identifying hazards in their districts. Maintain contact with staff officers, equipment manufacturers, and standards-making organizations to provide a safety perspective.

- Maintain a liaison with the fire department physician, the Infection Control Officer, and the fire department health and fitness coordinator.

- Function as the department's Infection Control Officer if one does not exist.

- Ensure that a Critical Incident Stress Management (CISM) program is established and meets the requirements of NFPA 1500.

Assure that safety and health issues are addressed during a postincident analysis. Based on input from the incident's ISO, the HSO is required to provide a written report of the safety aspects of an incident.

The HSO also must have knowledge of issues related to risk management, building construction, accident prevention, emergency incident operations, and infection control procedures. Other functions of the Safety Officer may include the development and design of new apparatus, the purchase of turnout gear and other personal protective equipment (PPE), and the incorporation of safety and health into the design of fire stations and facilities.

INCIDENT SAFETY OFFICER

The nature of the emergency responder's duties puts them at risk of illness, injury, or death. Incident safety should be a primary concern of **all** those who respond. The ICS helps minimize the risk to responders by allowing the IC to appoint and use an ISO. The ISO is a member of the IC's Command Staff. While the IC has overall responsibility for the safety of the responders, the ISO has the **direct** responsibility, and focuses on the safety aspects of the incident, including the welfare of the members assigned to the incident.

INCIDENT SAFETY OFFICER FUNCTIONS

NFPA 1521 defines the ISO as an individual appointed to respond to or assigned at an incident scene by the IC to perform the duties and responsibilities specified in the Standard. This individual can be the HSO, or it can be a separate position.

The definition in NFPA 1500 repeats most of what is in NFPA 1521, and reinforces the fact that the ISO is part of the Command Staff.

Both NFPA Standards and the ICS Safety Officer description give the ISO the authority to alter, suspend, or terminate unsafe acts or hazardous activities. This makes the ISO position unique within the ICS organization. While the ICS typically follows the chain of command, the ISO can bypass the chain of command to correct unsafe actions or remove responders from the threat of immediate danger. For example, he/she may remove firefighters from the interior of a structure that has the potential of imminent collapse, or remove responders from the area of an overturned vehicle that has not been shored properly to prevent it from rolling over. Whenever the ISO takes action to remove responders from the threat of danger, he/she must advise their immediate supervisor and the IC of the action taken and the rationale. The ISO also is responsible for identifying existing or potential hazards that do not present an imminent threat to responder IC to incorporate them into the IAP and anticipate modifications that may be needed.

The safety of responders must be addressed at every emergency. SOP's address safety at routine operations. The ISO is charged with monitoring the safety of responders at an incident that involves multiple emergency units. The functions of the ISO may be filled by the HSO or performed by any officer/member qualified to act, and designated by the IC.

The ISO is a member who has knowledge of safety, hazards, and the safety procedures established within the agency. The ISO does not need to be an officer. NFPA 1521 contains the job requirements and needed knowledge of the ISO. Although he/she may be asked to perform some non-emergency followup activities, the majority of the work of the ISO is performed at the scene.

The scene of an emergency is one of the most hazardous working areas for a responder. Responders may concentrate more on the work at hand than on the safety of those working at the incident. Therefore, the only job of the ISO is to focus on the safety of emergency operations and provide the IC with needed safety information and recommendations.

The criteria for the response or appointment of an ISO must be identified clearly in the fire department's SOP's. Criteria for the appointment of an ISO also must be defined.

The duties of the ISO are defined clearly in NFPA 1521 and include

- The ISO and any assistant ISO must be identified clearly on the scene. The ISO must make Command aware of the need for assistant ISO's.

- The ISO must monitor responder safety on the scene and make sure that actions fall within the department's Risk Management Plan. If activities fall outside of the plan, the ISO has the authority to terminate or suspend them.

- The ISO must make sure that the IC establishes a rehabilitation component.

- The ISO must monitor the scene and provide the IC with reports on conditions, hazards, and risks.

- The ISO must assure that the department's accountability system is in use.

- The ISO must review the IAP provided by the IC, and provide the IC with a risk assessment based on the plan.

- The ISO must assure that collapse zones, hot zones, and safety zones are known to all members operating on the scene.

- The ISO must monitor vehicle traffic near an incident to ensure the safety of responders, and may cause apparatus to be repositioned to provide a shield. The ISO also must assist in the safe establishment of landing zones when helicopters are used at incident scenes.

- While on the scene of a structural fire incident, the ISO must assure that Rapid Intervention Crews (RIC's) are in place, advise the IC on the potential for building collapse or fire extension, rapid fire progress, and access and egress for crews fighting the fire.

- While on the scene of an emergency medical incident, the ISO must assure that proper infection control practices are in active use and that rehabilitation and CISM are activated when needed.

- While on the scene of a hazardous materials or special operations incidents, the ISO must attend planning sessions to provide safety input, assure that a safety briefing for all responders is conducted, develop and distribute a Safety IAP, assure the designation and marking of hot, warm, and decontamination zones, and meet with the IC to assure that rehabilitation, accountability, RIC, and provisions for feeding and hygiene are in place for longer duration incidents.

- The ISO will communicate information about members who become ill or are injured on the scene, initiate an accident investigation as required by departmental SOP's, and request assistance from the HSO when needed.

- The ISO prepares a written report for the postincident analysis (PIA), that includes information about the incident from an occupational safety and health perspective.

- The ISO must monitor radio traffic to ensure that any communications barriers that could affect responder safety are addressed.

SAFETY INCIDENT ACTION PLAN

Being an effective risk manager requires a plan for monitoring conditions and actions at the incident. Much like the IC's IAP, the Safety IAP at most incidents is done informally through verbal communications. At large-scale or long-running incidents the safety plan is an integral part of a written IAP. Complex or large emergencies may also require more than one ISO to monitor the safety of responders.

As the incident risk manager, the ISO should properly document the safety aspects of the incident. Good documentation is important in the event of an injury or death of a responder, as part of the PIA, and as a part of the department's records for the incident.

HEALTH AND SAFETY OFFICER/INCIDENT SAFETY OFFICER RELATIONSHIP

The duties of the HSO and the ISO both focus on firefighter safety. However, the work of the HSO generally is pre-emergency or nonemergency in nature and the work of the ISO most often is performed

at the incident scene. If the HSO performs safety duties at the scene of an emergency, he/she is functioning as the ISO.

Because the HSO is a single individual, he/she cannot possibly be available to respond as the ISO to every emergency incident. If the HSO is unavailable to act as the ISO, the IC will appoint another member of the agency to perform those functions. Some very large agencies may assign on-duty ISO's. However, in most agencies, the IC assigns the ISO at the scene. Therefore, the HSO should ensure that other members of the agency are adequately trained to a level to perform as an ISO and that the qualifications for being appointed as an ISO are clearly outlined in the department's SOP's.

Regardless how each position is filled, it is important they work together to improve safety. The ISO should inform the HSO of any unusual problems or situations encountered during the incident. For example, the ISO may observe some practices during an incident that need to be modified in the current SOP's, or require new procedures. Working together, the two can make the necessary changes to the organization's SOP's or develop the procedures that will enhance responder safety in the future.

Should a responder be injured or killed at an incident, the ISO and the HSO will need to work closely to determine the circumstances surrounding the death or injury. They also must work together to determine the cause of any illness a responder may contract as a result of response.

Working with the HSO enables the ISO to develop a better understanding of the rationale for existing SOP's. This understanding enables the ISO to identify unsafe practices and to recognize when responders may need treatment or rehabilitation.

SUMMARY

There are many critical components to the safety process for a fire department, involving both shared and individual responsibilities. An effective safety and health program for both emergency and nonemergency activities begins with the commitment of the fire chief. The fire chief appoints an HSO to manage the occupational safety and health program and to ensure compliance with laws, codes, and standards. Command officers, CO's, and firefighters are the key to ensuring that incident operations are conducted effectively and safely. The ISO is the focal point for managing this process.

The incident scene is the most hazardous area of operations. Through the use of an effective ICS, the incorporation of risk management, and the use of the HSO and ISO, firefighter fatalities and injuries can be reduced and operations will become more efficient.

Activity 4.1

Safety Incident Action Plan

Purpose

To write a Safety IAP for a particular type of incident.

Directions

1. Work in your assigned small groups. You will have 10 minutes to complete the activity.

2. View the photograph provided by the instructor and develop the main bullet points of a Safety IAP on an easel pad.

3. Prioritize the aspects of your plan and appoint a spokesperson for your group. Your spokesperson will present the five most significant aspects of your plan as identified by your group.

Overturned vehicle:

_____
_____
_____
_____

Four-story building fire:

_____
_____
_____
_____

Vacant structure fire:

_____
_____
_____
_____

Appliance store fire:

Crash on foggy highway:

House fire in snow:

Crash into pole:

Train derailment:

NOTE-TAKING GUIDE

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UNIT 4:
SAFETY RESPONSIBILITIES

Slide 4-1

Slide 4-2

TERMINAL OBJECTIVE

At the conclusion of this unit, the students will be able to describe the safety role of all responders operating within the Incident Command System (ICS).

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ENABLING OBJECTIVES

The students will:

- **Describe the safety responsibilities outlined in National Fire Protection Association (NFPA) 1500, *Standard on Fire Department Occupational Safety and Health Program,* and NFPA 1521, *Standard for Fire Department Safety Officer.***

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ENABLING OBJECTIVES (cont'd)

- **Describe how the roles of the Incident Commander (IC), Health and Safety Officer (HSO), and Incident Safety Officer (ISO) interrelate.**
- **Describe the components of the Incident Action Plan (IAP) and the Safety IAP.**
- **Develop a Safety IAP for a specific incident.**

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INTRODUCTION

- **Incident scene safety is the ultimate responsibility of the IC.**
- **The Incident Management System (IMS), HSO, ISO, IAP, and Safety IAP provide assistance.**
- **Everyone on the scene has safety responsibilities.**

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INTRODUCTION (cont'd)

- **Safety responsibilities are included in NFPA 1500 and NFPA 1521.**
- **Importance of the IAP and the Safety IAP.**

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INCIDENT COMMANDER

- **Focuses on strategic issues**
- **Uses risk management principles**
- **Evaluates acceptable risks and benefits**

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INCIDENT SAFETY OFFICER AND THE INCIDENT COMMANDER

- **ISO assists the IC.**
- **"Eyes and ears."**
- **Direct access to the IC.**
  - **Clarity of information.**
  - **Reflection of the importance of the ISO.**
- **ISO should be a regular part of incident management.**

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INCIDENT ACTION PLAN

- **Defines strategic goals, tactical objectives, risk management, member safety, and support needs.**
- **Incident complexity drives the form of the IAP.**
- **IC responsibility, planning function.**

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SAFETY RESPONSIBILITIES

- **Everyone has a role.**
- **Fire chief.**
  - **Occupational safety and health program.**
  - **Written Risk Management Plan.**
  - **Personal commitment to safety.**
  - **Necessary support.**

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SAFETY RESPONSIBILITIES (cont'd)

HSO

- **Sometimes referred to as fire department Safety Officer**
- **NFPA 1500 requirement**
- **Appointed by the fire chief**
- **Reports directly to the fire chief**
- **Occupational safety and health program management**

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HEALTH AND SAFETY OFFICER

- **The HSO also may serve as the ISO.**
- **Department-level.**
- **Must be an officer.**
- **Trained to Fire Officer I.**
- **Knowledge of hazards, Standard Operating Procedures (SOP's), standards, safety management, and physical fitness.**

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HEALTH AND SAFETY OFFICER (cont'd)

- **Primarily administrative functions**
- **Major impact on emergency operations**
- **Safety and wellness**
- **Major list of duties**

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INCIDENT SAFETY OFFICER

- **Appointed by the IC**
- **May be HSO**
- **Member of the IC's Command Staff**
- **Authority to alter, suspend, or terminate operations**
  - **May bypass the chain of command**

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INCIDENT SAFETY OFFICER (cont'd)

- **Does not need to be an officer**
- **Job confined to the incident scene**
  - **May have some followup duties**
- **The ISO's only job is to monitor the safety of responders**
- **Assistant ISO's permitted**

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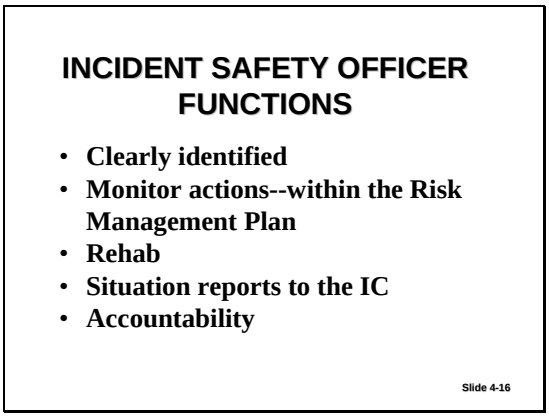

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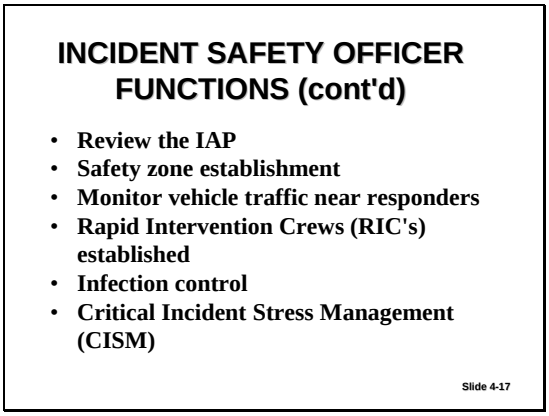

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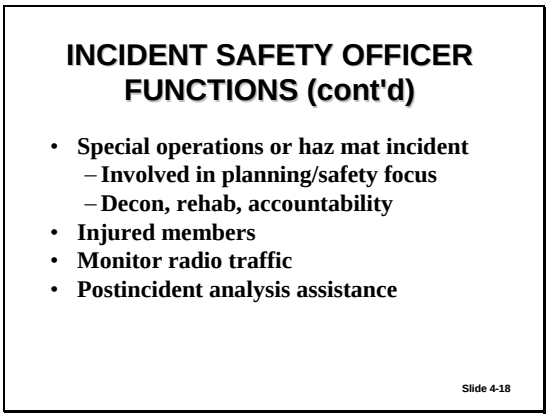

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SAFETY INCIDENT ACTION PLAN

- **Usually informal or verbal**
  - **–Usually in the ISO's head**
  - **–Communication with assistant ISO's**
- **Document the safety aspects of the incident**

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THE HEALTH AND SAFETY OFFICER/INCIDENT SAFETY OFFICER RELATIONSHIP

- **HSO--Pre-emergency**
- **ISO--Emergency**
- **ISO → HSO communication**
- **Firefighter injury or death**

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Activity 4.1
Safety Incident Action Plan

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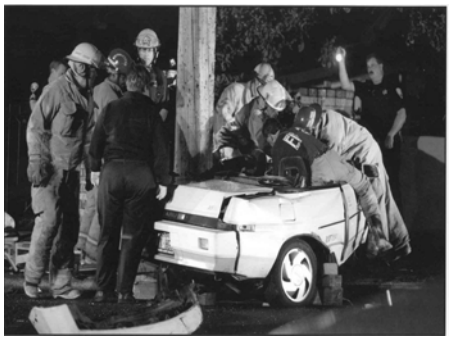

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SUMMARY

- **Fire chief's commitment to safety**
- **HSO role**
- **Role of every responder**
- **Components of onscene safety**
  - **ICS**
  - **Risk management, SOP's**
  - **ISO**

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UNIT 5: CURRENT ISSUES

TERMINAL OBJECTIVE

At the conclusion of this unit, the students will be able to describe firefighter safety concerns relating to current issues in the fire service.

ENABLING OBJECTIVES

The students will:

1. *Describe the hazards associated with wildland firefighting.*
2. *Describe the hazards present at highway/traffic incidents.*
3. *Describe the firefighter safety concerns relating to incidents involving terrorism.*
4. *Describe the importance of communications as it relates to firefighter safety.*
5. *Identify the risks to emergency responders related to health exposures.*
6. *Describe the importance of incident scene rehabilitation.*
7. *Develop the outline of a Standard Operating Procedure (SOP) related to a current issue.*

WILDLAND FIREFIGHTER SAFETY

Wildland and structural firefighters are finding themselves in dangerous role reversals more frequently. For example, wildland firefighters may be called on to protect threatened homes, and structural firefighters may be called on to help battle the surrounding blazes in the wildlands.

Characteristics of Wildland Fires

Doug Campbell is quoted below regarding the effects of humidity on forest fuels and the effects of solar radiation on baseline fuel moisture from his 2001, article "Using Humidity or Solar Radiation to Predict Fire Behavior."

> The humidity establishes the baseline fuel moisture content of fuels according to the time lag fuel moisture content of the forest fuel. Humidity readings and fuel moisture measurements are useful to determine the fire behavior potential when no other heating force is present in the fuel bed. Humidity readings used to determine the fuel moisture in 1 and 10 hour time lag fuels are most accurate at night, under cloud cover or under heavy canopy.
>
> Fuels exposed to solar heating are heated and dried beyond the humidity's influence. Forest fuel beds become highly variable in temperature and moisture content due to the variation of solar heating within the fuel bed. Available fuels heated by radiation do not follow the time lag formula of 1 and 10 hour fuels, but change within minutes not hours. The variation of fuel temperature is the cause of the variation in fuel flammability, during daytime hours.

Wildland versus Structural Firefighting

In addition to the obvious difference of size, wildland fires require more personnel and more resources spread out over a larger area. Because of these factors, wildland fires present three areas of safety concerns:

1. The firefighter.
2. The area immediately surrounding the firefighter.
3. The overall environment of the fire itself.

Wildland fires require long hours of arduous work in the worst of conditions.

Tools and Personal Protective Equipment

Tools and personal protective equipment (PPE) are fundamentally different for structure and wildland firefighting.

- **Flame-resistant trousers and shirts** do not absorb moisture, allow air to pass through, and allow free movement.
- **Hardhat** is lightweight, impact-resistant, and well ventilated to protect against heat stress.
- **Ventilated safety goggles with impact-resistant lenses** minimize fogging.
- **Cotton bandana** is used for respiratory protection.
- **Leather gloves** are treated for thermal and flame resistance and designed with minimal seams to prevent blisters when using tools.
- **High-top, leather work boots worn with wool socks** are lightweight enough to prevent fatigue over long periods of time.
- **Field packs** distribute weight along the hips and can be removed easily in emergencies.
- **Wool jacket** has natural fire-resistant properties and good air flow.
- **Fire shelter** is the last-chance lifesaver and used only when every possible means of escape is exhausted.

The protective equipment used for wildland firefighting does have limitations. Clothing does not provide thermal or steam protection. Self-contained breathing apparatus (SCBA) are not used in the wildland environment, leaving firefighters vulnerable to smoke inhalation and carbon monoxide poisoning. Prolonged burning aggravates thermal inversions trapping smoke and gases close to the ground and increasing the risk of exposure.

Ten Standard Fire Orders

The 10 Standard Fire Orders were developed in 1957 by a task force studying ways to prevent firefighter injuries and fatalities. Shortly after the Standard Fire Orders were incorporated into firefighter training, the **18 Situations That Shout Watch Out** were developed. These 18 situations are more specific and cautionary than the Standard Fire Orders, and described situations that expand the 10 points of the Fire Orders. If firefighters follow the 10 Standard Fire Orders and are alerted to the 18 Watch Out Situations, much of the risk of firefighting can be reduced.

10 STANDARD FIRE ORDERS

The National Wildfire Coordinating Group (NWCG) parent group just approved the revision of the 10 Standard Fire Orders in accordance with their original arrangement. The original arrangement of the Orders is logically organized to be implemented systematically and applied to all fire situations.

Fire Behavior

1. Keep informed on fire weather conditions and forecasts.
2. Know what your fire is doing at all times.
3. Base all actions on current and expected behavior of the fire.

Fireline Safety

4. Identify escape routes and make them known.
5. Post lookouts when there is possible danger.
6. Be alert. Keep calm. Think clearly. Act decisively.

Organizational Control

7. Maintain prompt communications with your forces, your supervisor, and adjoining forces.
8. Give clear instructions and ensure they are understood.
9. Maintain control of your forces at all times.

If 1 through 9 are considered, then

10. Fight fire agressively, having provided for safety first.

The 10 Standard Fire Orders are firm. We don't break them; we don't bend them. All firefighters have a right to a safe assignment.

18 WATCH OUT SITUATIONS

1. Fire not scouted and sized up.
2. In country not seen in daylight.
3. Safety zones and escape routes not identified.
4. Unfamiliar with weather and local factors influencing fire behavior.
5. Uninformed on strategy, tactics, and hazards.
6. Instructions and assignments not clear.
7. No communication link between crewmembers and supervisors.
8. Constructing line without safe anchor point.
9. Building line downhill with fire below.
10. Attempting frontal assault on fire.
11. Unburned fuel between you and the fire.
12. Cannot see main fire, not in contact with anyone who can.
13. On a hillside where rolling material can ignite fuel below.
14. Weather gets hotter and drier.
15. Wind increases and/or changes direction.
16. Getting frequent spot fires across line.
17. Terrain or fuels make escape to safety zones difficult.
18. Feel like taking a nap near fireline.

Lookouts-Communications-Escape Routes-Safety Zones

In the wildland fire environment, four basic safety hazards confront the firefighter--lightning, fire-weakened timber, rolling rocks, and entrapment by running fires. Each firefighter must know the interconnection of **Lookouts, Communications, Escape Routes, and Safety Zones (LCES)**. LCES should be established before fighting the fire: select lookouts, set up communications, choose escape routes, and select safety zones.

LCES functions sequentially--it's a self-triggering mechanism. Lookouts assess, and reassess, the fire environment and communicate threats to safety; firefighters use escape routes to safety zones. All firefighters should be alert to changes in the fire environment and have the authority to initiate communication.

LCES is built on two basic guidelines: 1) Before safety is threatened, each firefighter must know how the LCES system will be used, and 2) LCES must be reevaluated continuously as fire conditions change.

The LCES system approach to fireline safety is an outgrowth of an analysis of fatalities and near misses for over 20 years of active fireline suppression duties. LCES simply focuses on the essential elements of the Standard Fire Orders. Its use should be automatic in fireline operations, and all firefighters should know the LCES interconnection.

LCES is part of the Ten Standard Fire Orders for wildland firefighting.

LCES Checklist

1. All personnel need to be informed.
2. Update throughout the shift.
3. Lookouts / Communications
   - Competent and trusted individual(s)?
   - Radio and frequencies?
   - Watch or time piece?
   - Map and communication plan?
   - Knowledge of crew(s) location on division?
   - Good vantage and safe location?
4. Escape Routes
   - Scouted?
   - Walkable?
   - Timed?
   - Marked?
   - Away from fire head?
5. Safety Zones (no shelters needed)
   - Clean Burn / natural / Man-made / Vehicles
   - Scouted?
   - Timed?
   - Close enough? Anticipated ROS
   - Large enough? Consider number of people. Consider fuels / flame length.
   - Terrain? Avoid sadles; chutes; box canyons.
   - Snags or rolling rocks?

HIGHWAY OPERATIONS

According to the National Fire Protection Association (NFPA, 2000), from 1995 through 1999, 17 firefighters were struck and killed by motorists. This equates to an 89-percent increase in the number of such line-of-duty deaths over the previous 5-year period.

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

- preserve life;
- prevent injury to emergency workers;
- protect property; and
- restore traffic flow.

Managing a highway incident and other related problems is a team effort. Each responding agency has a role to play in an effective incident operation. Law enforcement, Department of Transportation (DOT) and the fire and rescue department all play important roles in the management of highway incidents. It is not a question of "Who is in charge?" but

"Who is in charge of what?" Care of the injured, protection of the public, safety of the emergency responders, and clearance of the traffic lanes should all be priority concerns of the Incident Commander (IC).

Restoring the roadway to normal or near to normal as soon as possible creates a safer environment for motorists and emergency responders. It also improves the public's perception of the agencies involved and reduces the time and dollar loss resulting from the incident. A vehicle accident is the most common emergency response and the one that often carries the greatest risk to personnel.

Command

It is imperative that Command be established early into any highway operation. The IC is the overall Safety Officer and is responsible to ensure safe working conditions. The operational mode must be determined. This helps in identifying required resources to mitigate the hazard. For example, if a hazardous material is involved, what additional resources would be required for an evacuation?

As in any other operation, accountability of personnel is mandatory. However in an incident where multiagencies have personnel and resources at the incident scene, accountability is even more difficult. An accountability group may be established with representatives from multiple agencies assisting in this task.

The management of an incident involving multiple agencies is difficult. Determining who is in charge of what and when is always a contention for disagreement. Identifying each responding agency and their particular role and responsibility can avoid a power struggle when an incident occurs. This can be avoided by establishing preincident agreements with law enforcement, the DOT, and emergency medical services (EMS) agencies that identify each agency's roles and responsibilities prior to an occurrence. In addition, mutual-aid agreements should be established that identify specific responses to deliver appropriate equipment and staffing to the incident.

Roles and Responsibilities

Each responding agency has specific roles and responsibilities at a highway scene.

Fire Department

The responsibilities include

- control and extinguish fires;
- establish safe work zones;
- deploy warning devices to give motorists early notification and reaction time;
- control and mitigate any hazardous materials;
- coordinate the control of traffic with law enforcement;
- assist EMS in the treatment and removal of patients;
- extricate trapped victims; and
- preserve scene for investigation teams.

Emergency Medical Services

The responsibilities include

- evaluate the condition of patients;
- treatment; and
- transportation.

Law Enforcement

The responsibilities include

- coordinate with fire department to establish traffic control;
- secure scene from bystanders; and
- assist in the identification of any fatalities.

Department of Transportation

The responsibilities include

- coordinate with fire department for the use of heavy equipment for extrication or removal;

- provide resources and logistical support;
- establish variable message safety boards for motorists; and
- assist with traffic control by the use of movable barriers or vehicles.

Vehicle Recovery Personnel

The responsibilities include

- coordinate with fire department and law enforcement for the removal of vehicles; and
- assist with heavy extrication and removal.

Response

The Company Officer (CO) is responsible for the safety of the company from the time the apparatus leaves quarters until its return. Safety of the crew is foremost in both emergency and nonemergency situations. Personnel must make every effort to minimize the risk of injury to themselves and those who use the highway system. Personnel will wear appropriate gear and be seated with seatbelt on prior to their vehicle responding to all incidents.

When units respond to nonemergency situations, all traffic laws governing normal driving practices should be followed. Response should be at normal driving speed. Upon arrival, the situation is assessed to determine the need for additional resources and safety work zones are established.

Units responding together in the same direction to an emergency situation should remain in single file in relatively close proximity to one another. This reduces motorists' confusion about how to appropriately yield the right of way to emergency apparatus.

The left travel lane is the preferable lane of response. When the shoulder must be used, apparatus operators must use extreme caution. Be aware of:

- road signs;
- debris;
- guardrails; and
- oversized vehicles and stopped vehicles.

Vehicle operators must follow all laws governing emergency vehicle response and reduce speed when using the shoulder of the road. A safe response speed for shoulder travel should not exceed 35 miles per hour (mph).

Response on access ramps should be in the normal direction of travel, unless an officer on the scene can confirm that oncoming traffic has been stopped and no other vehicles will be encountered.

Under no circumstances should crossovers be used for routine changes in travel direction. Large median strip crossovers marked "Authorized Vehicles Only" should be used only when apparatus can complete the turn without obstructing the flow of traffic in either travel direction or all vehicular traffic has come to a complete stop.

Onscene Actions

The proper spotting and placement of apparatus is the joint responsibility of the driver and officer. The proper positioning of apparatus at the incident scene assures other responding resources easy access, a safe working area and contributes to an effective overall operation. Standard practice is to position apparatus in an area of at least one lane wider than the width of the incident to ensure a safe work area. This may be difficult to accomplish on secondary and one-lane roads. Position the apparatus to provide the safest work area possible. The work zone should allow EMS units and the rescue unit to position in close proximity to the incident.

First-arriving engine placement should be back at some distance from the incident, using it as a safety shield to block only those travel lanes necessary.

The engine should be placed at an angle to the lanes, with the pump panel toward the incident and the front wheels rotated away from the incident. This is commonly referred to as the "fend-out" position.

In the event that a motorist strikes the engine, the engine will act as a barrier. In the unlikely event the engine is moved upon impact, it will travel away from the work zone.

The pump panel should face the incident to provide protection for the operator while monitoring apparatus functions. (See Figure 5-1).

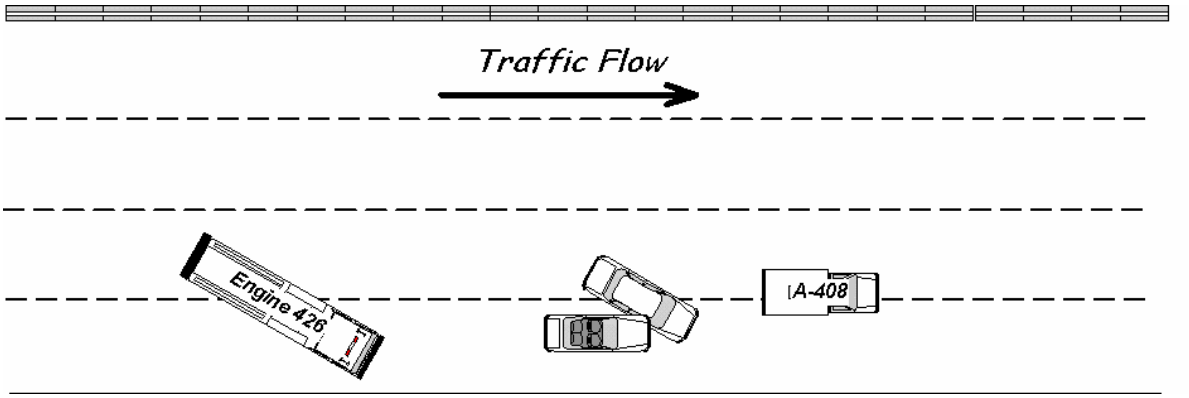


Figure 5-1
Engine Placement

Prior to exiting apparatus, personnel must

- Check to ensure that traffic has stopped to avoid the possibility of being struck by a passing vehicle.
- Communicate with all personnel via the onboard communications system that traffic has come to a stop and it is safe to exit.
- Look down to ensure that debris on the roadway will not become an obstacle, resulting in a personal injury.
- Be in full protective clothing or traffic vests as the situation indicates.

The engine operator should be used as a safety lookout until the appointment of an Incident Safety Officer (ISO), because this firefighter has the best overall view of the incident scene and can monitor approaching traffic. As soon as possible, the engine operator should place flares (unless flammable or combustible liquids have spilled or are leaking) and traffic cones. Traffic cones assist in channeling traffic away from the incident. Cones should be used whenever department vehicles are parked on or near any road surface. Placement of cones and/or flares begins closest to the incident, working towards oncoming traffic. Cones and/or flares are placed diagonally across the roadway and around the incident to help establish a safe work zone. When placing cones or flares, care should be exercised to avoid being struck by oncoming traffic.

Several other factors must be considered when placing apparatus at the scene of an incident. The type of roadway (e.g., two-lane highway, four-lane highway, or more), and direction of vehicular traffic (one-way, two-way, undivided traffic). The vehicle speed is related directly to perception reaction and braking distance, which is explained in Table 5-1.

Table 5-1
Vehicle Speed in Relation to Perception Reaction and Braking Distance

Posted Speed Limit (mph)	Feet per Second (fps)	Perception Reaction Distance (feet)	Braking Distance (feet)	Total Stopping Distance (feet)
35	51.3	77	60	137
45	65.9	99	100	199
55	80.6	121	145	266
65	95.3	143	200	343

The speed of traffic must be considered when establishing a safe work area. The following chart provides information to determine how far to place the first cone or flare away from the incident scene.

Table 5-2
Cone and Flare Placement at an Incident Scene

Posted Speed Limit (mph)	Distance (feet)
33	150
45	200
55	275
65	350

Weather should be taken into consideration when setting up the work zones. Rain and fog decrease motorist visibility and wet road surfaces increase the risk of secondary collisions.

When channeling traffic around the incident, cones also used in front of the incident with the same diagonal placement to direct traffic safely around the work zone. (See Figure 5-2.)

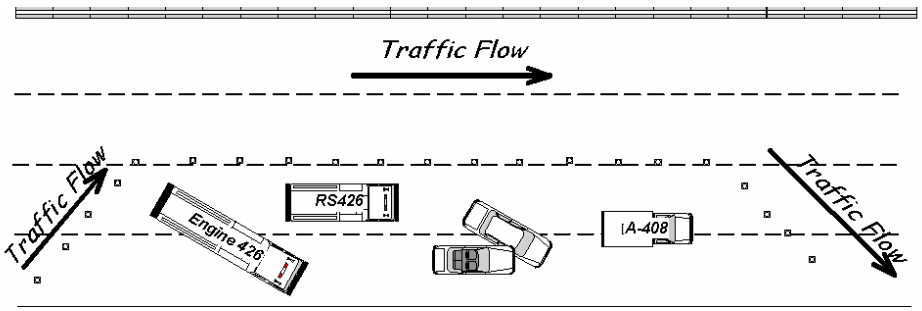


Figure 5-2
Cone Placement

It is possible to channel traffic around a curve, hill, or ramp. The first cone is placed well before the curve, hill, or ramp and placed in such a way that the oncoming driver is made aware of imminent danger. The rest of the cones are placed diagonally across the lanes around the work zone.

The first-arriving company will conduct initial sizeup and hazard risk analysis. Exits, shoulder areas, or a large median should be used for Staging Areas. Do not commit apparatus to a limited access highway unless required. Call for additional resources early, since their arrival may be delayed by due to traffic buildup. The need for rehab also should be considered early, especially in extreme weather conditions. Highway operations present limited resources and areas to remove personnel from the elements.

Parking of Response Vehicles

A four-point system should be used whenever vehicles are parked in an area that does not require the channeling of traffic (Figure 5-3). One cone is placed approximately 4 feet from each corner of the vehicle. This assists the motorist and incoming units to identify the established work zone. Additional cones should be placed to identify extended outriggers, booms, and heavy equipment when using this system around aerial apparatus and rescue squads. Keep as many traffic lanes open as possible.

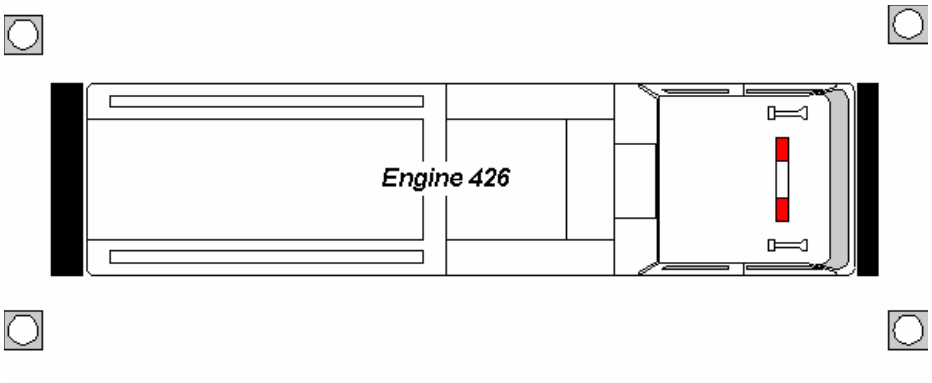


Figure 5-3
Four-Point System

All response vehicles, except those needed in the operation and those used as a shield for the work area, should be parked together in a designated area. If one exists, the shoulder or median area should be used. Parking response vehicles completely out of available travel lanes greatly assists in traffic flow. Vehicle headlights should be turned off when parked, if not needed to illuminate the scene.

Apparatus Visibility at Night

Two critical issues related to night visibility are color recognition and glare recovery. Because most emergency vehicle warning lights are red, it is important to remember that as the human eye adapts to the dark, the first color to leave the spectrum is red. Red tends to blend into the nighttime surroundings. Many of the newer vehicles now have a combination of red and strobes.

Vision recovery from the effects of glare depends on the prevailing light conditions. Vision recovery from dark to light takes 3 seconds; from light to dark takes at least 6 seconds. A vehicle traveling at 50 mph covers approximately 75 feet per second--or 450 feet in the 6 seconds before the driver fully regains night vision. This is extremely important when operating on roadways at night. Headlights on the apparatus that shine directly into oncoming traffic can result in drivers literally passing the incident scene blind with no sense of apparatus placement.

Wearing protective clothing and/or traffic vests does not improve the ability of the blinded driver to see personnel standing in the roadway. Studies show that the opposing driver is completely blinded at two and a half car lengths from a vehicle with its headlights on. The best combination of lights to provide maximum visibility is

- red warning lights off;
- headlights off;
- fog lights off;
- pump panel lights on;
- spotlights on rear (and front if equipped) on and directed on to a traffic cone;
- traffic directional boards operating; and
- low beams to light the area if they are directed only on the immediate scene.

Clearing Traffic Lanes

Reducing and/or shutting down traffic lanes creates other problems and safety concerns. Closing traffic lanes or keeping lanes closed unnecessarily disrupts traffic throughout the area, can significantly affect businesses in the region, and greatly increases the risk of a secondary incident resulting from traffic backup. One minute of stopped traffic causes an additional 4-minute traffic delay. Therefore, apparatus should be repositioned to allow traffic to flow on as many lanes as possible as soon as the operational phases (extrication, medical care, and suppression) are completed. The officer-in-charge should open closed lanes and place units in service as soon as practical. However, do not move vehicle parts or "nonessential" items that would later hamper a police investigation.

For additional information, please visit the following Web site: www.respondersafety.com

TERRORISM

Terrorism Defined

Terrorism is defined as the use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof to further political or social objectives. Terrorists have the knowledge and capability to strike anywhere in the world, and will do whatever they have to do to achieve their goal.

In recent years we have seen an increasing number of attacks against the government and civilians from both foreign and domestic groups. These include

- Oregon--biological agent dispersed in salad bars;
- Atlanta, GA--Olympics bombing;
- Atlanta, GA--abortion clinic bombing;

- Vail, CO--ski resort, incendiary (arson);
- Fairfax, VA--CIA; armed attack;
- New York City--first World Trade Center bombing;
- Oklahoma City, OK--Federal building bombing;
- New York City, Arlington, VA, Shanksville, PA--attacks using hijacked airplanes;
- Boca Raton, FL--anthrax attack; and
- New York City, Washington, DC--anthrax attacks via mail.

Terrorism took on a new dimension in the minds of the people in the United States after the September 11, 2001, attacks on the World Trade Center and the Pentagon. We no longer view our vulnerability in terms of isolated incidents. Our concept of terrorist tactics has changed forever. We now think in terms of airplanes used for routine domestic flights becoming weapons. The bio-terrorist threat became a reality with the spread of anthrax through the U.S. Postal Service (USPS). The concern exists that even emergency response vehicles can become weapons. We also know that responders can be targets at terrorist events. Recent events have shown there can be a carefully timed sequence of events planned to inflict further harm to those who respond to the initial incident. These events may include

- armed resistance;
- use of weapons;
- booby traps; and
- secondary events.

Categories of Terrorist Incidents

Chemical Incidents

Chemical agents fall into five classes:

1. Nerve agents.
2. Blister agents.
3. Blood agents.
4. Choking agents.
5. Irritating agents.

The primary routes of exposure to chemical agents are inhalation, ingestion, and skin absorption.

Biological Incidents

Biological agents are fairly accessible and spread rapidly. Biological agents include anthrax, tularemia, cholera, plague, botulism, and smallpox. Exposure to these agents can occur in a variety of ways: inhalation (aerosol spray or fine powder), ingestion (food or water contamination), direct skin contact, or injection.

Nuclear/Radiation Incidents

There are two threats in the area of nuclear incidents. The first is the threatened detonation of a nuclear bomb. The second is the threatened or actual detonation of a conventional explosive incorporating radioactive material. Although the potential for a terrorist organization having access to nuclear explosives was thought to be almost impossible, with the recent changes in terrorist events, we must never be complacent.

Explosive Incidents

It is estimated that 70 percent of worldwide terrorist attacks involve explosives. Bombings are the most likely terrorist attack to be encountered. Explosions rapidly release gas and heat, affecting both people and structures. Bombs almost always work as designed. It is important to remember that explosions can cause fires and fires can cause explosions. Firefighters must be aware at all times of the potential for secondary devices.

Incendiary Incidents

An incendiary device is any mechanical, electrical, or chemical device intentionally used to initiate combustion and start a fire. Incendiary devices may be simple or complex and come in all shapes and sizes. The type of device is limited only by the terrorist's imagination and ingenuity. Only specially trained personnel should handle incendiary devices discovered prior to ignition.

Potential Responder Injuries

There are many possibilities for injuries to firefighters and other emergency personnel responding to a terrorist incident. These include

- improvised explosive devices;

- secondary explosive devices;
- firearms;
- exposure to chemicals;
- trapped in building collapse;
- exposure to biological agents;
- exposure to infectious diseases;
- burns from incendiary fire;
- injuries due to damaged building; and
- overexertion.

There are no easy answers to protecting firefighters from these threats, but self-protection is built on the three key areas used for hazardous materials incidents: time, distance, and shielding.

Time: You should spend the shortest amount of time possible in the hazard area. Use techniques such as rapid entries to conduct reconnaissance and rescue. Minimizing time spent in the affected area also reduces the chance of contaminating the crime scene.

Distance: It should be an absolute rule to maintain a safe distance from the hazard area or projected hazard area. If at all possible, be upwind and uphill from the source. An excellent resource for determining safe distances is the Table of Initial Isolation and Protective Action Distances found in the *North American Emergency Response Guide* (NAERG). This book typically is carried on all emergency response vehicles. Additional copies may be available through local and State emergency management agencies.

Shielding can take various forms such as vehicles, buildings, walls, and PPE. However, no matter how much shielding is available, always take full advantage of time and distance.

United States Fire Administration

The United States Fire Administration (USFA) publishes the *Emergency Response to Terrorism: Job Aid*, which is designed to assist the first responder from the fire, EMS, haz mat, and law enforcement disciplines in identifying a possible terrorist/weapons of mass destruction (WMD) incident and implementing initial actions. This document is not a training manual but a "memory jogger" for those who have completed the appropriate level of training. This publication is available to emergency response organizations only and can be downloaded online from USFA publications at http://www.usfa.fema.gov

Determine Risks Versus Benefits

- low gain/high risk--no;
- moderate gain/low risk--go;
- low gain/moderate risk--no; and
- high gain/low risk--go.

Safety Considerations

Safety for these types of incidents will require a team approach. The ISO must work with law enforcement, technical advisors, assistant Safety Officers and special operational personnel (government and private), and must communicate closely with the Operations Section (to evaluate and establish operational zones) and EMS (to review exposure symptoms and treatment protocols). Other responsibilities include

- review, update, and communicate escape routes regularly;
- provide relief/rotation for Safety Officers;
- establish exposure and documentation procedures;
- notify medical facilities of the situation and patient status;
- monitor weather and its impact on operations;
- monitor time on scene;
- review Rapid Intervention Crew (RIC) operations;
- review Staging locations and procedures;
- review staffing and location of law enforcement;
- ensure scene safety; and
- provide rehabilitation areas.

COMMUNICATIONS

Several recent incidents involving firefighter fatalities demonstrate that, despite technological advances in two-way radio communications, important information is not always communicated adequately on the fireground or emergency incident scene. Inadequate communication has a definite negative impact on the safety of firefighters and may contribute to injuries or deaths of firefighters and civilians.

Inadequate fireground communication is cited repeatedly as a contributing factor in many of the incidents through the USFA Fire Fighter Fatality and Major Fires Investigation reports. Communication problems are cited continually as one of the four contributing factors in fires and emergency incidents where firefighters are killed or injured. Despite the obvious importance of effective communication on the emergency scene, only a limited amount of published research exists.

There are several USFA investigation reports that cite communications-related issues as part of the "lessons learned" component.

- *Wood Truss Roof Collapse Claims Two Fire Fighters, Memphis TN.* Two firefighters operating an interior attack line were killed at this fire after a church roof collapsed.

- *Indianapolis Athletic Club Fire, Indianapolis, IN.* Two firefighters were killed on the third floor of a nine-story mixed use building during a fire.

- *Four Fire Fighters Die in Seattle Warehouse Fire, Seattle, WA.* Four firefighters were killed in a collapse at an arson fire in a warehouse.

- *Two Fire Fighters Die in Auto Parts Store Fire, Chesapeake, VA.* Two firefighters were killed after a roof collapse in retail auto parts store.

Key Issues	Comments
Unsuitable equipment	The chief communication problem reported by firefighters and Company Officers (CO's) is the difficulty with communicating from inside a fire when using full PPE, including SCBA. The majority of portable radios currently used by fire departments are ill-suited for the task.
Portable radios needed for all firefighters	Despite some technical limitations, portable radios are a proven lifesaver during fires and emergency incidents. Portable radios should be considered a critical item of PPE similar to SCBA. Ideally, every firefighter working in an Immediately Dangerous to Life and Health (IDLH) atmosphere should have a portable radio with an emergency distress feature.
Little attention paid to human factors	There is available literature pertaining to the impact of human factors on effective fireground communication. Furthermore, while fire departments devote substantial time to manipulative skill training, relatively little training is provided to help firefighters develop stress-tempered communications skills.
Importance of active listening	All firefighters on an emergency incident should monitor their radios actively for important information at all times, not just when specifically queried. Communications should be emphasized as an essential part of firefighter functioning as a tactical team, not just operating as an individual entity.
Standard message formats and language	Fire departments can enhance fireground communications by creating standard message formats and keywords used consistently. Plain English usually is preferred over codes, especially when transmitting a complex message.
Tiered message priority	Keywords to prompt immediate action can be tiered based upon their priority. For example, "Mayday" signals a life-or-death situation, while "Urgent" may be used to signify a potentially serious problem. Such message headers prompt the crew's listening priorities and radio discipline.
Attention to cultural factors	If necessary, firefighters are not usually reluctant to circumvent the chain of command to report critical safety issues. There may be greater hesitation to communicate problems in completing an assigned task. However, this usually is due to a lack of situational awareness, and not a fear of reprisal from other members. Studies on firefighter communications show that sometimes the culture of bravery in the fire service is reflected in a reluctance to communicate quickly enough when help is needed. Repeated situations of this nature must be investigated by the department.

National Fire Protection Association 1561

NFPA 1561, *Standard on Emergency Services Incident Management System* requires the fire department to develop Standard Operating Procedures (SOP's) for radio communications, which address use of protocol and terminology at all types of incidents. These procedures will enhance the efficiency and effectiveness of the incident scene operations as well as firefighter safety.

There are definitive procedures in NFPA 1561 regarding radio communications, the Incident Management System (IMS), and emergency operations. These procedures include the use of clear text; providing a radio channel for dispatch and a separate tactical channel to be used initially during the incident; when a Tactical Level Management Unit (TLMU) is implemented, the fire department shall provide a dispatch channel, a Command channel, and a tactical channel; the fire department shall provide the necessary number of radio channels relating to incidents with multiple tactical channels and the complexity of these incidents; standard terminology will be established for transmitting information, strategic modes of operation, situation reports, and emergency notification of imminent hazards; the fire department shall have procedures for the announcement of emergency conditions, which is termed emergency traffic, as a designation to clear radio traffic; emergency traffic shall be declared by the IC, TLMU, or member who is in trouble or subjected to an emergency condition; procedures shall exist when emergency traffic is made; SOP's shall exist for telecommunicators (dispatchers) to provide support to emergency incident operations; telecommunicators shall be trained to function effectively within the IMS and shall meet the requirements of NFPA 1061, *Standard for Professional Qualifications for Public Safety Telecommunicator*; and the IC shall be provided with elapsed time-on-scene at emergency incidents in 10-minute intervals from the Communications Center.

INFECTION CONTROL

From the risk management perspective, nothing has affected fire and EMS greater than 29 Code of Federal Regulations (CFR) 1910.1030, *Bloodborne Pathogens*. The passage of this standard has forever changed the delivery of patient care that emergency medical agencies provide. This standard requires fire and EMS organizations to perform a risk assessment of their operations from the standpoint of personnel safety and health. This risk assessment covers both emergency and nonemergency duties and operations.

An exposure to a communicable disease can occur just as easily during the cleaning and decontamination of equipment at the fire station as it can during the delivery of patient care at the incident scene. A common philosophy that must spread throughout the fire and EMS community is that all patients must be treated as if they have a communicable disease.

Risk management as it relates to infection control identifies such issues as personal protective clothing, use of mechanical resuscitation equipment, vaccinations for personnel, training and education, the development of SOP's, and medical requirements. The consequences of an exposure to a variety of communicable diseases can be devastating for the infected member, his/her family, the fire department, and the jurisdiction (municipality, county, etc.). Fire and EMS personnel must place their safety first and foremost in each situation. As noted in fire service history, personnel safety has not always been a priority.

As stated in the Occupational Safety and Health Administration (OSHA) bloodborne pathogens standard, this standard applies to all occupational exposures to blood or other potentially infectious materials. An occupational exposure is defined as reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties.

The bloodborne pathogens standard does affect other prehospital care organizations such as law enforcement agencies, housekeeping/custodial personnel, mental health agencies, and other agencies that may be required to provide medical and/or first-aid treatment in the event of a medical emergency. In order to develop, implement, and manage an effective infection control program, it is imperative that fire service managers understand the regulations that govern infection control. The primary components of this OSHA standard are

- development of an exposure control plan for members at risk;
- training and education;
- engineering controls;
- PPE;
- housekeeping;
- hepatitis B vaccination;
- postexposure evaluation and followup; and
- medical recordkeeping.

The key to ensuring compliance with the standard is the development of the exposure control program and the training of members about the process. Though all of the components are critical to the health and welfare of the members, the written program provides the necessary

guidelines to ensure compliance and to ensure that personnel understand the infection control process. This process is accomplished by a thorough training and education program. Unfortunately, the issue of infection control and how to educate personnel with regard to this issue is not widely addressed. Personnel providing emergency medical care must realize that the hazards are real, and they must be able to protect themselves. Personnel can and are being infected and most are unaware of an exposure until notification through the treating hospital, testing during a medical examination, or actually contracting the disease (e.g., tuberculosis or chicken pox).

Even if a fire department does not provide EMS, there are means of exposure for personnel; for example, burn victims. An issue that quickly surfaces is whether or not a fire department is required to comply with the requirements of the bloodborne pathogens standard. The fire service must also consider the moral, ethical, and liability impact of this standard regardless of the compliance aspect.

The fire service is fortunate to have NFPA 1581, *Standard on Fire Department Infection Control Program* as a resource for infection control procedures. The NFPA 1581 requirements parallel the requirements of the OSHA bloodborne pathogens standard, but also provide specific criteria for an effective infection control program. The requirements affect both emergency and nonemergency situations. Yet another source of information is the USFA's *Guide to Developing and Managing an Emergency Service Infection Control Program.* This guide provides information on how to detail and implement a written infection control program. It also contains contacts for additional information.

The updated *Guide to Managing an Emergency Services Infection Control Program* provides new and expanded information in this area. Since the original publication in 1992, many advances have occurred in the field of infection control. The guide is designed to meet or exceed all applicable Federal laws and regulations and national standards and guidelines at the time of publication.

"Infection control, including issues such as Hepatitis C exposure, is an essential health and safety topic for the fire service today," said U.S. Fire Administrator R. David Paulison. "Every fire and emergency services department needs to have a strong infection control program as part of an overall departmental health and safety strategy." Limited quantities of this publication may be ordered free of charge. It is available in printed as well as downloadable format via the Internet. Visit the USFA on the World Wide Web at http://www.usfa.fema.gov Departments also can contact USFA's Publications Office at (800) 561-3356 or (301) 447-1189 or FAX your request to (301) 447-1213.

Hepatitis B immunoglobulins, hepatitis B vaccine, and antiretroviral agents for human immunodeficiency virus (HIV) post exposure prophylaxis (PEP) should be available for timely administration after exposure to suspected blood or other body fluids. Furthermore, medical evaluations, counseling and postexposure testing should be available whether or not PEP is administered. Fire departments should update their written "Communicable Disease Program" or Standard of Operations to assure consistency with the NFPA 1581 and the OSHA bloodborne pathogens standard [29 CFR 1910.1030; 56 Fed. Reg. 64004 (1991)]. All firefighters should be familiar with these recommendations.

Prevention is the most important and efficient manner of combating infectious diseases such as hepatitis B, C, and HIV. Education, training, and the proper use of PPE are the hallmark of prevention. Universal precautions should be used whenever there is potential for exposure to blood and body fluids. In addition, training and refresher courses should be offered on a regular basis. Specific recommendations can be found in NFPA 1581.

INCIDENT SCENE REHABILITATION

The fire department shall develop SOP's that outline a systematic approach for the rehabilitation of members operating at incidents. Provisions addressed in these procedures shall include medical evaluation and treatment, food and fluid replenishment, crew rotation, and relief from extreme climatic conditions. This program should outline an ongoing rehabilitation for simple or short-duration incidents as well as a process to transition into the rehabilitation needs of a large or long-duration incident. Medical evaluation and treatment in the onscene rehabilitation area should be conducted according to EMS protocols developed by the fire department in consultation with the fire department physician and the EMS medical director. If ALS personnel are available, this level of EMS care is preferred. The IC shall consider the circumstances of each incident and initiate rest and rehabilitation of members in accordance with the fire department's standard operating procedures and with Chapter 8 of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, and NFPA 1584, *Recommended Practice on the Rehabilitation for Members Operating at Incident Scene Operations and Training Exercises*.

Weather factors during emergency incidents can have a severe effect on the safety and health of the members. Where these factors combine with long-duration incidents or situations that require heavy exertion, the risks to members increase rapidly. The fire department should develop

procedures, in consultation with the fire department physician, to provide relief from adverse climatic conditions.

Typical rehabilitation considerations for operations during hot weather extremes include

- move fatigued or unassigned members away from the hazardous area of the incident;
- remove PPE;
- ensure that personnel are out of direct sunlight;
- ensure that there is adequate air movement over personnel, either naturally or mechanically;
- provide members with fluid replenishment, especially water; and
- provide medical evaluation for personnel showing signs or symptoms of heat exhaustion or heat stroke.

Typical rehabilitation considerations for operations during cold weather extremes should include

- move fatigued or unassigned members away from the hazardous area of the incident;
- provide shelter from wind and temperature extremes;
- provide members with fluid replenishment, especially water; and
- provide medical evaluation for members showing signs or symptoms of frostbite, hypothermia, or other cold-related injury.

The ISO shall ensure that the IC establishes an incident scene rehabilitation tactical level management unit during emergency operations as required by NFPA 1521, *Standard for Fire Department Safety Officer*.

The incident scene rehabilitation area shall include emergency medical care. The minimum level of emergency medical care available shall be at least basic life support (BLS) care. The assignment of an ambulance or other support crew to the rehabilitation function is essential during long-duration or heavy-exertion incident operations. This crew can assist with rehabilitation functions as well as be available to provide immediate BLS needs for members. However, the ALS (paramedic) level of evaluation and treatment must be available quickly to ensure the proper level of care.

The rehabilitation area shall be established in a safe environment away from the hazardous area of the incident. The resources needed at the rehabilitation area shall include an environment to limit temperature stress, medical equipment, and adequate medical staff. Items that can assist in limiting temperature stress in cold environments include heat, blankets, and protection from the wind. For hot weather, items should include adequate shade, fans, air conditioning, and misting systems. Food and

hydration needs include water and oral fluids, food, broth, and fruit. Also, for hydration, a 50/50 mixture of water and an electrolyte replacement drink can be provided. Medical equipment should include blood pressure cuffs, stethoscopes, oxygen, cardiac monitors, thermometers, and intravenous fluid and supplies.

Weather Extremes

Weather factors during emergency incidents can have a severe impact on the safety and health of the members. Humidity and wind have significant effects on temperature. Figure 6-1 shows the effect of wind. Figure 6-2 shows the injuries associated with Heat Stress Index conditions, and Figure 6-3 shows temperature extermes. Where these factors combine with long duration incidents or situations that require heavy exertion, the risks to members increase rapidly. The fire department should develop procedures, in consultation with the fire department physician, to provide relief from adverse climatic conditions.

Wind Chill Factor Index

	Temperature, °F												
Wind Speed MPH	45	40	35	30	25	20	15	10	5	0	-5	-10	-15
5	43	37	32	27	22	16	11	6	0	-5	-10	-15	-21
10	34	28	22	16	10	3	-3	-9	-15	-22	-27	-34	-40
15	29	23	16	9	2	-5	-11	-18	-25	-31	-38	-45	-51
20	26	19	12	4	-3	-10	-17	-24	-31	-39	-46	-53	-60
25	23	16	8	1	-7	-15	-22	-29	-36	-44	-51	-59	-66
30	21	13	6	-2	-10	-18	-25	-33	-41	-49	-56	-64	-71
35	20	12	4	-4	-12	-20	-27	-35	-43	-52	-58	-67	-75
40	19	11	3	-5	-13	-21	-29	-37	-45	-53	-60	-69	-76
45	18	10	2	-6	-14	-22	-30	-38	-46	-54	-62	-70	-78

Wind Chill Temperature, °F	Danger
Above 25°F	Little danger for properly clothed person
25°F to -70°F	Increasing danger, flesh may freeze
Below -70°F	Great danger, flesh may freeze in 30 seconds

Figure 6-1
Wind Chill Temperatures

Injuries Associated with Heat Stress Index Conditions

Heat Index °F	Danger Category	Injury Threat
Below 60°	None	Little to no danger under normal circumstances
80° to 90°	Caution	Fatigue possible if exposure is prolonged and there is prolonged physical activity
90° to 105°	Extreme Caution	Heat cramps and heat exhaustion possible if exposure is prolonged and there is physical activity
105° to 130°	Danger	Heat cramps and heat exhaustion likely and heat stroke possible if exposure is prolonged and there is physical activity
Above 130°	Extreme Danger	Heat stroke is imminent

Figure 6-2
Heat Stress Injuries

Heat Stress Index

	Relative Humidity								
Temp °F	10 %	20 %	30 %	40 %	50 %	60 %	70 %	80 %	90 %
104	98	104	110	120	132				
102	97	101	108	117	125				
100	95	99	105	110	120	132			
98	93	97	101	106	110	125			
96	91	95	98	104	108	120	128		
94	89	93	95	100	105	111	122		
92	87	90	92	96	100	106	115	122	
90	85	88	90	92	96	100	106	114	122
88	82	86	87	89	93	95	100	106	115
86	80	84	85	87	90	92	96	100	109
82	77	79	80	81	84	86	89	91	95
80	75	77	78	79	81	83	85	86	89
78	72	75	77	78	79	80	81	83	85
76	70	72	75	76	77	77	77	78	79
74	68	70	73	74	75	75	75	76	77

Note: Add 10° when protective clothing is worn and add 10° when in direct sunlight.

Figure 6-3
Heat Stress Index

SUMMARY

There are several dynamic and changing issues in the fire service. The issues mentioned in this unit are not an all-inclusive list. The hazards and risks associated with highway incidents, weather extremes, and terrorism require specialized training and definitive SOP's. Though highway incidents occur on a consistent basis, terrorism does not, thankfully. Firefighters must be prepared to develop and implement mitigation strategies to combat the problems associated with these incidents. The ISO is a critical component to this process to ensure the safe outcome of an incident involving any one of these situations. The more training and preparation firefighters have, the more likely the incident will have a standard outcome.

Activity 5.1

Outline for a Highway/Traffic Standard Operating Procedure

Purpose

To draft an outline for a highway and/or traffic SOP.

Directions

1. You will be working in a small group for this assignment.

2. Each group will draft an outline for a sample SOP for highway/traffic safety. The SOP can be developed based upon the type of response the department provides for highway/traffic incidents.

3. The SOP can be developed based upon information covered in this unit and information from the group members, based on safe practices.

4. Each group will have 20 minutes to develop the SOP.

5. Each group will have 5 minutes to present its draft SOP to the class.

6. After each group has presented its assignment, the instructor will facilitate a discussion to determine the key points that need to be addressed in this SOP.

Activity 5.1 (cont'd)

Worksheet

Purpose: _____

_____

_____

_____

Scope: _____

_____

_____

_____

Contents:_____

_____

_____

_____

Key Points: _____

_____

_____

_____

Risk Management: _____

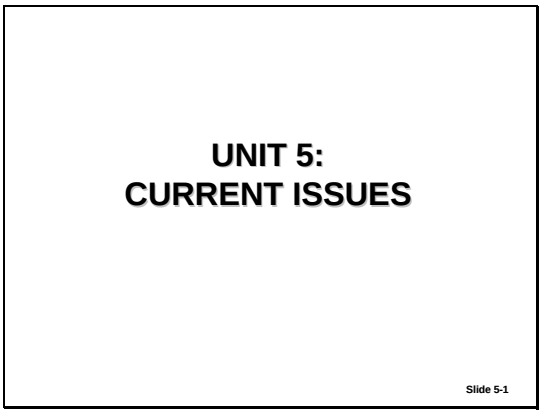
_____

_____

_____

NOTE-TAKING GUIDE

Slide 5-1



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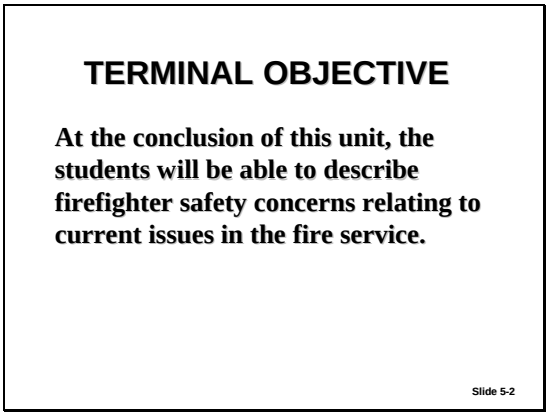

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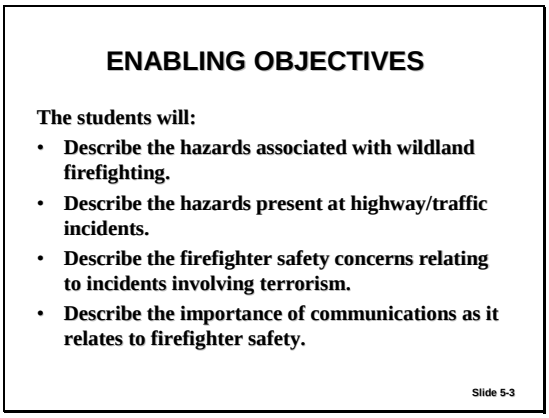


Slide 5-4

ENABLING OBJECTIVES (cont'd)

- **Identify the risks to emergency responders related to health exposures.**
- **Describe the importance of incident scene rehabilitation.**
- **Develop the outline of a Standard Operating Procedure (SOP) related to a current issue.**

Slide 5-4

Slide 5-5

WILDLAND FIREFIGHTER SAFETY

Slide 5-5

Slide 5-6

CHARACTERISTICS OF WILDLAND FIRES

- **Effect of humidity on forest fuels**
- **Effect of solar radiation on baseline fuel moisture**

Slide 5-6

Slide 5-7

WILDLAND VERSUS STRUCTURAL FIREFIGHTING

- **Personal protective equipment (PPE)**
- **Tools**
- **Equipment**

Slide 5-7

Slide 5-8

10 STANDARD FIRE ORDERS

Fire Behavior

1. **Keep informed on fire weather conditions and forecasts.**
2. **Know what your fire is doing at all times.**
3. **Base all actions on current and expected behavior of the fire.**

Slide 5-8

Slide 5-9

10 STANDARD FIRE ORDERS (cont'd)

Fireline Safety

4. **Identify escape routes and make them known.**
5. **Post lookouts when there is possible danger.**
6. **Be alert. Keep calm. Think clearly. Act decisively.**

Slide 5-9

Slide 5-10

10 STANDARD FIRE ORDERS (cont'd)

Organizational Control

7. **Maintain prompt communications with your forces, your supervisor, and adjoining forces.**
8. **Give clear instructions and ensure they are understood.**
9. **Maintain control of your forces at all times.**
10. **Fight fire aggressively, having provided for safety first.**

Slide 5-10

Slide 5-11

18 WATCH OUT SITUATIONS

1. **Fire not scouted and sized up**
2. **In country not seen in daylight**
3. **Safety zones and escape routes not identified**
4. **Unfamiliar with weather and local factors influencing fire behavior**
5. **Uninformed on strategy, tactics, and hazards**
6. **Instructions and assignments not clear**

Slide 5-11

Slide 5-12

18 WATCH OUT SITUATIONS (cont'd)

7. **No communication link between crewmembers and supervisors**
8. **Constructing line without safe anchor point**
9. **Building line downhill with fire below**
10. **Attempting frontal assault on fire**
11. **Unburned fuel between you and the fire**
12. **Cannot see main fire, not in contact with anyone who can**

Slide 5-12

Slide 5-13

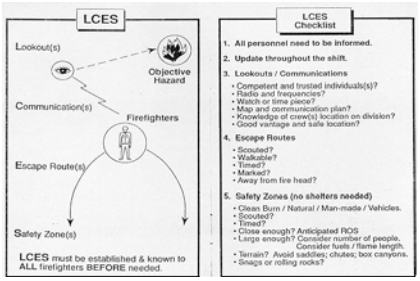
18 WATCH OUT SITUATIONS (cont'd)

13. **On a hillside where rolling material can ignite fuel below**
14. **Weather gets hotter and drier**
15. **Wind increases and/or changes direction**
16. **Getting frequent spot fires across line**
17. **Terrain or fuels make escape to safety zones difficult**
18. **Feel like taking a nap near fireline**

Slide 5-13

Slide 5-14

LOOKOUTS-COMMUNICATIONS-ESCAPE ROUTES-SAFETY ZONES

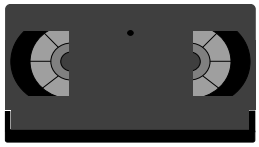


Slide 5-14

Slide 5-15

VIDEO:

"Firefighter Safety for Wildland Fires"



Slide 5-15

Slide 5-16

HIGHWAY OPERATIONS

Primary objectives

- **Preserve life**
- **Prevent injury to emergency workers**
- **Protect property**
- **Restore traffic flow**

Slide 5-16

Slide 5-17

HIGHWAY OPERATIONS (cont'd)

Team effort

- **Fire/Rescue**
- **Law enforcement**
- **Department of Transportation (DOT)**
- **Who is in charge of what?**

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Slide 5-18

HIGHWAY OPERATIONS (cont'd)

Command

- **Incident Command System (ICS)**
- **Operational mode**
- **Accountability**
- **Unified Command**
- **Memorandums of Agreement (MOA's) between agencies**
- **Mutual-aid agreements**

Slide 5-18

Slide 5-19

ROLES AND RESPONSIBILITIES

Fire department

- **Control/Extinguish fires**
- **Establish safe work zones**
- **Deploy warning devices**
- **Control/Mitigate hazardous materials**
- **Coordinate with law enforcement**
- **Assist or provide emergency medical services (EMS)**
- **Extricate trapped victims**
- **Preserve scene**

Slide 5-19

Slide 5-20

ROLES AND RESPONSIBILITIES (cont'd)

EMS

- **Evaluate patients**
- **Treat and transport**

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Slide 5-21

ROLES AND RESPONSIBILITIES (cont'd)

Law enforcement

- **Coordinate with fire for traffic control**
- **Secure scene**
- **Assist in identification of fatalities**

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Slide 5-22

ROLES AND RESPONSIBILITIES (cont'd)

DOT

- **Coordinate with fire department for equipment use**
- **Provide resources/logistical support**
- **Establish message safety boards**
- **Assist with traffic control**

Slide 5-22

Slide 5-23

ROLES AND RESPONSIBILITIES (cont'd)

Vehicle recovery personnel

- **Coordinate with fire and police for vehicle removal**
- **Assist with heavy extrication**

Slide 5-23

Slide 5-24

RESPONSE

Nonemergency

- **Seatbelt/Restraint for all responses**
- **Follow all traffic laws and use normal speed**
- **Assess need for additional resources**
- **Establish safety work zones**

Slide 5-24

Slide 5-25

RESPONSE (cont'd)

Emergency

- **Wear PPE--highly visible apparel--American Society of Mechanical Engineers (ASME)**
- **Multiple units responding together travel in same direction in single file and close proximity**
- **Travel in left lane**
- **Caution if using shoulder**
- **Follow all traffic laws governing emergency vehicle response**

Slide 5-25

Slide 5-26

ONSCENE ACTIONS

- **Scene safety**
- **Park apparatus at an angle**
- **Apparatus will serve as a barrier in the event of an incident**
- **Protection of the pump operator**

Slide 5-26

Slide 5-27

ONSCENE ACTIONS (cont'd)

Exiting apparatus

- **Watch traffic**
- **Communicate with all members of the company regarding**
- **Safety**
- **PPE and reflective garments**

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Slide 5-28

TRAFFIC CONTROL

- First-arriving officer must conduct a risk analysis.
- Traffic cones placed by pump operator.
- Stopping distances/scene protection based on posted speed limit.
- Weather needs to be considered, which can increase stopping distances.
- Coordinate with law enforcement.
- Request additional resources early.

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Slide 5-29

PARKING APPARATUS

- Four-point system
- Used when possible
- Designate a Staging Area for apparatus that will not be used
- Reduce number of emergency lights to amber if possible
- Turn off headlights

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Slide 5-30

VISIBILITY AT NIGHT

- Color recognition
- Glare recovery
- Methods for optimum scene lighting
  - Warning lights off
  - Headlights off
  - Pump panel lights on
  - Fog lights off
  - Spotlights on and directed toward traffic cones
  - Traffic directional boards operating

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Slide 5-31

CLEARING TRAFFIC LANES

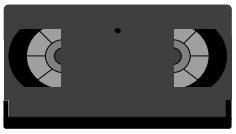
- **1 minute of stopped traffic = 3- to 4-minute delay**
- **Close only lanes that are necessary**
- **If safety is an issue, close all needed lanes**
- **Coordinate with law enforcement**

Slide 5-31

Slide 5-32

VIDEO:

"Highway Safety for Emergency Services"



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TERRORISM

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TERRORISM

Definition: The use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof to further political or social objectives.

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TERRORIST ATTACKS

Foreign and Domestic Groups

- **Atlanta, GA--Olympics bombing**
- **Atlanta, GA--abortion clinic bombing**
- **Vail, CO--ski resort, Incendiary (arson)**
- **Fairfax, VA--Central Intelligence Agency (CIA) armed attack**
- **New York City--first World Trade Center bombing**
- **Oklahoma City, OK--Federal building bombing**
- **New York City, Arlington, VA, Shanksville, PA--attacks using hijacked airplanes**
- **Boca Raton, FL--anthrax attacks**
- **New York City, Washington, D.C.--anthrax attacks via mail**

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TERRORIST ATTACKS (cont'd)

September 11, 2001

- **World Trade Center--New York**
- **Pentagon--Arlington, VA**
- **Reality of international terrorism in the United States**

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Slide 5-37

CATEGORIES OF TERRORIST INCIDENTS

- **Chemical**
- **Biological**
- **Radiological**
- **Nuclear**
- **Explosive**

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POTENTIAL RESPONDER INJURIES

- **Improvised and secondary explosive devices**
- **Firearms**
- **Exposure to chemicals**
- **Trapped in building collapse**
- **Exposure to biological agents**
- **Exposure to infectious diseases**
- **Burns from incendiary fire**
- **Injuries due to damaged building**
- **Overexertion**

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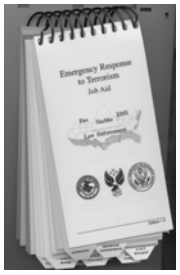
U.S. FIRE ADMINISTRATION

- ***Emergency Response to Terrorism: Job Aid***
- **USFA publications at http://www.usfa.fema.gov**



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Slide 5-40

DETERMINE RISKS VERSUS BENEFITS

- **Low gain/High risk--no**
- **Moderate gain/Low risk--go**
- **Low gain/Moderate risk--no**
- **High gain/Low risk--go**

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SAFETY CONSIDERATIONS

- **Review/Update/Communicate escape routes regularly**
- **Provide relief/rotation for Safety Officers**
- **Establish exposure and documentation procedures**
- **Notify medical facilities of the situation and patient status**
- **Monitor weather/impact on incident**
- **Monitor time**

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SAFETY CONSIDERATIONS (cont'd)

- **Review Rapid Intervention Crew (RIC) operations**
- **Review Staging locations and procedures**
- **Review staffing and location of law enforcement**
- **Scene security**
- **Provide rehabilitation areas**

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Slide 5-43

COMMUNICATIONS

Firefighter safety issues

- **Equipment**
- **SOP's**
- **USFA Technical Reports**
- **Firefighter fatality studies**

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Slide 5-44

KEY ISSUES

Issues	Comments
Unsuitable Equipment	**Officers and firefighters report difficulty communicating from inside a structure when using full PPE, including self-contained breathing apparatus (SCBA). Majority of portable radios do not function properly.**
Portable Radios	**Portable radios serve as a proven lifeline during fire and emergency incidents for officers and firefighters. These items should be considered a critical component of the protective equipment ensemble.**
Human Factors	**Human factors affect effective fireground communications. Relatively little training is provided by fire departments to help firefighters develop stress-tempered communication skills.**

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KEY ISSUES (cont'd)

Issues	Comments
Active Listening	**All officers and firefighters should actively monitor their radios for important information. Communications should be emphasized as part of the company concept.**
Standard Message Formats and Language	**Fire departments should improve fireground communications by creating standard message formats. Plain English should be used versus 10-codes.**
Tiered Message Priority	**"Mayday" signals a life-or-death situation, while "Urgent" or "Emergency Traffic" may be used to signify potentially serious problems.**
Cultural Factors	**Studies have indicated the culture of bravery in the fire service is reflected in a reluctance to communicate quickly enough when help is needed.**

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NATIONAL FIRE PROTECTION ASSOCIATION 1561

- **NFPA 1561, *Standard on Emergency Services Incident Management System***
- **Communications**
  - **– Radio communications, the Incident Management System (IMS), and emergency operations**
  - **– Procedures include the use of clear text**
  - **– Providing a radio channel for dispatch and a separate tactical channel to be used initially during the incident**

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NATIONAL FIRE PROTECTION ASSOCIATION 1561 (cont'd)

- **When a Tactical Level Management Unit (TLMU) is implemented, the fire department shall provide a dispatch channel, a Command channel, and a tactical channel.**
- **Standard terminology will be established for transmitting information, strategic modes of operation, situation reports, and emergency notification of imminent hazards.**

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NATIONAL FIRE PROTECTION ASSOCIATION 1561 (cont'd)

- **Fire department shall have procedures for the announcement of emergency conditions.**
- **Emergency traffic shall be declared by the Incident Commander (IC), TLMU, or member who is in trouble or subjected to an emergency condition.**

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NATIONAL FIRE PROTECTION ASSOCIATION 1561 (cont'd)

- **Telecommunicators.**
  - **– Function effectively within the IMS.**
  - **– Meet the requirements of NFPA 1061, *Standard for Professional Qualifications for Public Safety Telecommunicator.***
- **IC shall be provided with elapsed time-on-scene at emergency incidents in 10-minute intervals from the Communications Center.**

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INFECTION CONTROL

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INFECTION CONTROL

Standards

- **Occupational Safety and Health Administration (OSHA)**
  - **– 29 Code of Federal Regulations (CFR) 1910.1030, *Bloodborne Pathogens, The Final Rule***
- **NFPA**
  - **– NFPA 1581, *Standard on Fire Department Infection Control Program***

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INFECTION CONTROL (cont'd)

USFA *Guide to Managing an Emergency Services Infection Control Program*

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INCIDENT SCENE REHABILITATION

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INCIDENT SCENE REHABILITATION

Program goals

- **Medical evaluation**
- **Medical treatment (if needed)**
- **Fluid replenishment**
- **Food replenishment (long duration)**
- **Crew rotation**
- **Relief from weather extremes**
  - **Hot**
  - **Cold**
  - **Rain**

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INCIDENT SCENE REHABILITATION (cont'd)

SOP's

- **Short-term incidents**
- **Long-duration incidents**

Process should comply with:

- **Department medical director**
- **NFPA requirements:**
  - **NFPA 1500**
  - **NFPA 1561**
  - **NFPA 1584**
- **Industry standards**

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Slide 5-56

INCIDENT SCENE REHABILITATION (cont'd)

Preventing heat-related injuries

- **Moving fatigued or unassigned members away from the hazardous area of the incident**
- **Removal of PPE**
- **Ensuring that personnel are out of direct sunlight**

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INCIDENT SCENE REHABILITATION (cont'd)

Preventing heat-related injuries (cont'd)

- **Ensuring that there is adequate air movement over personnel, either naturally or mechanically**
- **Providing members with fluid replenishment, especially water**
- **Providing medical evaluation for personnel showing signs or symptoms of heat exhaustion or heat stroke**

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INCIDENT SCENE REHABILITATION (cont'd)

Preventing cold-related injuries

- **Moving fatigued or unassigned members away from the hazardous area of the incident**
- **Providing shelter from wind and temperature extremes**
- **Providing members with fluid replenishment, especially water**
- **Providing medical evaluation for members showing signs or symptoms of frostbite, hypothermia, or other cold-related injury**

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INCIDENT SCENE REHABILITATION (cont'd)

Rehabilitation area

- **Established in a safe area**
- **Basic Life Support (BLS) medical care, minimum**
- **Consideration of weather extremes**
- **Fluid replenishment**

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Slide 5-60

IDENTIFYING WEATHER EXTREMES

Slide 5-60

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WEATHER EXTREMES

- **Humidity and wind have significant effects on temperature**
- **Three charts in Student Manual (SM) outline:**
  - **Wind chill temperature and danger**
  - **Injuries associated with Heat Stress Index conditions**
  - **Temperature extremes**

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Slide 5-62

WIND CHILL TEMPERATURES

Wind Chill Factor Index

	Temperature, °F											
Wind Speed MPH	45	40	35	30	25	20	15	10	5	0	-5	-10	-15
5	43	37	32	27	22	16	11	6	0	-5	-10	-15	-21
10	34	28	22	16	10	3	-3	-9	-15	-22	-27	-34	-40
15	29	23	16	9	2	-5	-11	-18	-25	-31	-38	-45	-51
20	26	19	12	4	-3	-10	-17	-24	-31	-39	-46	-53	-60
25	23	16	8	1	-7	-15	-22	-29	-36	-44	-51	-59	-66
30	21	13	6	-2	-10	-18	-25	-33	-41	-49	-56	-64	-71
35	20	12	4	-4	-12	-20	-27	-35	-43	-52	-58	-67	-75
40	19	11	3	-5	-13	-21	-29	-37	-45	-53	-60	-69	-76
45	18	10	2	-6	-14	-22	-30	-38	-46	-54	-62	-70	-78

Wind Chill Temperature, °F	Danger
Above 25°F	Little danger for properly clothed person
25°F to -70°F	Increasing danger, flesh may freeze
Below -70°F	Great danger, flesh may freeze in 30 seconds

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Slide 5-63

HEAT STRESS INJURIES

Injuries Associated with Heat Stress Index Conditions

Heat Index °F	Danger Category	Injury Threat
Below 60°	**None**	**Little to no danger under normal circumstances**
80° to 90°	**Caution**	**Fatigue possible if exposure is prolonged and there is prolonged physical activity**
90° to 105°	**Extreme Caution**	**Heat cramps and heat exhaustion possible if exposure is prolonged and there is physical activity**
105° to 130°	**Danger**	**Heat cramps and heat exhaustion likely and heat stroke possible if exposure is prolonged and there is physical activity**
Above 130°	**Extreme Danger**	**Heat stroke is imminent**

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Slide 5-64

HEAT STRESS INDEX

Heat Stress Index

Temp °F	Relative Humidity								
	10 %	20 %	30 %	40 %	50 %	60 %	70 %	80 %	90 %
104	98	104	110	120	132				
102	97	101	108	117	125				
100	95	99	105	110	120	132			
98	93	97	101	106	110	125			
96	91	95	98	104	108	120	128		
94	89	93	95	100	105	111	122		
92	87	90	92	96	100	106	115	122	
90	85	88	90	92	96	100	106	114	122
88	82	86	87	89	93	95	100	106	115
86	80	84	85	87	90	92	96	100	109
82	77	79	80	81	84	86	89	91	95
80	75	77	78	79	81	83	85	86	89
78	72	75	77	78	79	80	81	83	85
76	70	72	75	76	77	77	77	78	79
74	68	70	73	74	75	75	75	76	77

Note: Add 10° when protective clothing is worn and add 10° when in direct sunlight.

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SUMMARY

- **Highway/Traffic incidents are low risk/high frequency incidents**
  - **SOP's**
  - **Training**
- **Terrorism consists of high-risk, low-frequency incidents**
  - **Planning**
  - **ICS**
  - **Training**
- **Communications**

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Slide 5-66

SUMMARY (cont'd)

- **Infection control**
  - **Standards**
  - **Training and education**
- **Incident scene rehabilitation**
  - **Firefighter safety**
  - **Weather extremes**

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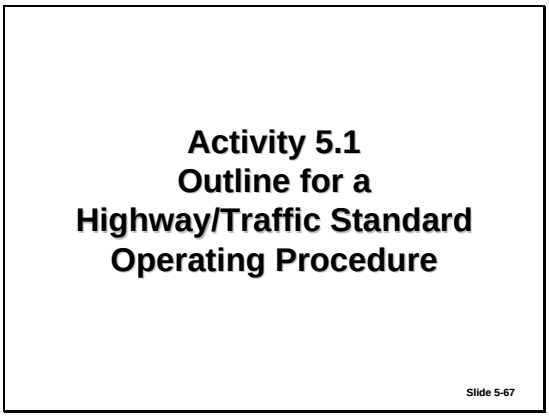
Slide 5-67


Activity 5.1
Outline for a
Highway/Traffic Standard
Operating Procedure
Slide 5-67

UNIT 6: OPERATIONAL RISK MANAGEMENT

TERMINAL OBJECTIVE

At the conclusion of this unit, the students will be able to apply risk management principles to emergency operations.

ENABLING OBJECTIVES

The students will:

1. *Discuss pre-emergency risk control measures.*
2. *Given photographs of an emergency incident and working in small groups, identify immediate risks to responders.*
3. *Given photographs of an emergency incident and working in small groups, forecast potential risks to responders.*
4. *Discuss the importance of recognizing low-frequency/high-severity incidents.*
5. *Discuss the difference between pre-emergency and operational risk management.*
6. *Given video segments, identify immediate hazards; determine the need and the method to terminate unsafe operations.*

INTRODUCTION

Incident scene activities are "show time" for risk management. All of the planning that went into the development of procedures and the purchasing of protective clothing and equipment has been completed and it is time for those protective measures to do their jobs. The Health and Safety Officer (HSO) will not be at every emergency incident, but the training that has been delivered beforehand to firefighters and Company Officers (CO's) will come into play. On the incident scene, virtually any firefighter can become the Incident Safety Officer (ISO). The Incident Commander (IC) assigns this responsibility.

THE INCIDENT SAFETY OFFICER'S ROLE IN EMERGENCY RISK MANAGEMENT

The ISO's first task as the risk manager for emergency scenes is to ensure that all pre-emergency risk management measures are in use and being followed by responders. Personal protective equipment (PPE) and infection control equipment are of no value unless they are used at the emergency. The ISO should survey the emergency scene actively and make sure that all members engaged in operations are protected properly. Other pre-emergency risk management measures, such as the use of cold, warm, and hot zones for hazardous materials emergencies, also must be in place.

The ISO must watch constantly to make sure that safety equipment is in place and that safety procedures are being followed. Emergencies are dynamic events, so the ISO must monitor the emergency scene continually. A scene that is safe at one moment may not be safe 30 minutes later.

Every responder at the scene has a safety responsibility. Individual members have a duty to perform their tasks in a safe manner, watch out for the safety of other responders, and cooperate with safety procedures. CO's have the responsibility to look out for the safety of their crews and Command officers working under the Incident Command System (ICS) have a responsibility to the crews under their control.

The IC depends on the ISO to monitor the safety of the scene. This may require the ISO to issue corrective instructions to responders. This does not mean that the ISO needs to take on the role of safety cop. Safety is too important to be turned into a game of cop and robber. If problems are noted, the ISO should correct them in the simplest way possible. Responder safety is the goal, not trying to catch and punish errors.

The ISO's only job at the scene of an emergency is to oversee and monitor the safety of responders. The ISO cannot be tied down to a single location, since emergency conditions are always changing. Assigning other duties or responsibilities to the ISO is not appropriate, given the risks faced by responders. The ISO must look for risks of immediate danger to responders and evaluate the scene continuously for potential risks that may develop in the near future.

THE INCIDENT SAFETY OFFICER'S KNOWLEDGE OF RISKS

The ISO must be well versed in the procedures of the agency and the dangers that are present at emergency scenes. Most agencies will not designate an ISO prior to an incident. Very few agencies have the staffing or call volume necessary to appoint an on-duty ISO. Some volunteer organizations may designate an individual to serve as the ISO, but other members may fill the position if the designated ISO is unavailable.

Whether the ISO is designated beforehand or chosen at the scene, the IC and all responders rely on him/her to keep a safety focus. The ISO relies on his/her prior working experience, training in emergency operations and safety, safety cues, and intuition to help identify existing safety risks and forecast what will happen as operations continue.

FORECASTING

Given the fact that emergency scenes are dangerous places with rapidly changing conditions, the ISO must monitor the safety of responders constantly. The ISO must be concerned with both hazards that present an immediate danger and those that may become dangerous. The ISO must **forecast** the future of the emergency as it relates to responder safety. No member, not even the ISO, can predict the future with 100-percent accuracy. The ISO must rely on his/her experience, training, safety cues, and intuition to stay ahead of the emergency and predict developments that will affect the safety of responders.

A TV meteorologist uses information provided by the National Weather Service, local radar, and satellite images to predict or **forecast** the weather. Likewise, the ISO has tools that can be used to forecast the future of an emergency. The tools described below are intended to assist the ISO with structural fires, emergency medical incidents, and special operations incidents.

Structural Forecasting Tools

The Features of the Fire Building

- Access to the interior may be difficult for firefighters. Maze-like floor plans increase risks.
- Utilities that are provided to the building: gas, electricity, steam, etc.
- The occupancy of the building--has the building been occupied recently?
- Unoccupied buildings present significant dangers and less benefit for risks taken.

Fire Protection Systems

- Operating sprinklers indicate a working fire. Cold smoke may result from a fire controlled by sprinklers.
- Added weight from sprinkler water eventually may cause structural problems.
- Automatic or manual smoke vents may assist firefighters working in interior positions.
- The presence of special agent systems, such as dry chemicals and Halon, indicates a special hazard is present. These systems usually are designed to discharge only one time and may create a localized oxygen-deficient atmosphere.

Access for Fire Crews

- Working in large buildings presents fatigue problems.
- If the fire appears to be in hidden spaces, opening up for suppression will be time-consuming and will cause firefighters to become fatigued.

Egress for Crews Working on the Interior

- Crews must be able to find their way out if an emergency occurs.
- Ladders to upper-story windows provide alternative escape routes.
- Fires that are hidden in concealed spaces often progress very rapidly when they are exposed to oxygen.

Construction Type

- Bowstring truss and lightweight truss roofs often fail early. Their failures can have dramatic and deadly consequences.
- Look for the presence of "stars" and other indications that the structure has been reinforced by steel rods.
- Look and listen for early signs of structural failure, e.g., groaning, smoking mortar, bulges.
- Look for other construction hazards such as suspended loads.
- Concrete tilt construction buildings have attachment points that are susceptible to heating and failure.

Age of the Fire Building

- Older buildings generally do not have lightweight trusses.
- Egress and access may be difficult.
- Look for signs of structural weakness, such as reinforcing rods.
- A new building is just as likely to collapse as an older building.

The Potential for Fire Extension into Exposed Buildings

- Gauge the amount of fire involvement.
- The distance between buildings affects extention.
- Wind conditions.

Amount of Fire Involvement

- Big fires usually mean no survivors and less benefit from risk to firefighters engaged in interior operations.
- Lots of fire involvement leads to early structural failure.

Roof Hazards

- Ladders at two corners allow for escape.
- Firefighters walking on structural members.
- No "roof shepherds"; once the hole is cut, get off the roof.
- If the fire is well vented, no hole is needed.
- Watch for potential collapse, bowstring trusses, lightweight wood trusses, etc.

Time

- Time from ignition to flashover may be as little as 2 or 3 minutes.
- The longer the fire burns, the weaker the structure becomes.
- Taking into account the time interval between the arrival of the first unit on the scene and the response time of the ISO, it is possible that the incident has been going on for much longer than the ISO has been there.
- Time can work against emergency responders.

The Incident Commander's Tactical Objectives

- If things do not go as the IC hoped, firefighters must be able to remove themselves from the hazard area.
- The ISO must know the IC's attack plan and how it will be carried out.

- Water supply (hydrants or tanker operation) must be adequate to support safe operations. Insufficient water, or running out of water, can put firefighters in a dangerous position. Look for hydrants or recommend a tanker operation.

The Weather

- Extreme heat dictates the early initiation of rehab, and more frequent work/rest cycles.

- Cold weather presents hazards in addition to hypothermia, e.g., slippery surfaces, mud.

  - Frozen water from hose applications stresses the structure of the building.

  - Snow or ice on the roof makes roof operations more difficult and hazardous.

- Electrical storms may create lightning hazards.

- Ground ladders may be blown over by strong winds.

Medical Emergency Forecasting Tools

Generally, on medical emergencies, the ISO must consider such things as protection from communicable diseases, or protection from physical hazards, such as sharp surfaces. Use full PPE during an extrication, including members who are inside the car as it is being cut apart.

Violent Acts

- If a crowd has gathered, individuals may become agitated or violent toward responders.

- The person who committed the violent act still may be in the area.

- Escape routes will be needed if the situation worsens.

- Law enforcement presence helps to ensure the safety of responders.

Protection from Surroundings

- Moving traffic--emergency vehicles should be used to shield from traffic if possible.
- Car/Pedestrian accident--move patient onto curb and out of traffic for treatment, if possible.
- Weather--heat, cold, rain, sleet, etc.

Sufficient Staffing

- Staffing must be adequate to carry and load the patient(s) into the ambulance.
- Help may be available from bystanders or law enforcement officials.
- If the patient is far from the road or from a paved surface, more people will be needed to carry the gurney.

Special Operations Forecasting Tools

- Incident durations will be longer.
- Technical experts should be present at the scene.
- The ISO must be capable of ensuring the safety of responders engaged in special operations.
- Be certain that properly equipped responders are available for rescue of members in hazardous area.
- Time generally is less of a factor because more time is available to prepare for action.
- Time also can be an enemy to responders who may drop their guard and be less aware of hazards as the incident drags on.

Terrorism and Weapons of Mass Destruction Forecasting

- What is the current terrorism threat level?

- What organizations occupy the building that is the focus of the incident, and the surrounding buildings? The presence of a building that houses a group that is the focus of hate crimes is a red flag.

- Are there too many responders close to the scene? Are Staging Areas assessed for the presence of a secondary device?

Emergency Medical Support

As a part of the forecasting process, the ISO should attempt to predict the need for emergency medical services (EMS) support on the scene of non-EMS emergencies. In many communities, the local EMS provider routinely responds to all structural fires. If EMS does not respond initially, the ISO should forecast the need for this support and request it from the IC.

In some cases, EMS support is required by National Fire Protection Association (NFPA) 1500, *Standard on Fire Department Occuaptional Safety and Health Program.* The highest available level of EMS must be provided where responders are performing special operations such as hazardous materials control. This support must be at least Basic Life Support (BLS) with medical transportation available. At all other emergency incidents, the IC must evaluate the risks to responders and request at least BLS-level EMS with transport capability to stand by at the scene, if necessary. The ISO should assist the IC with this decision.

Once EMS support has arrived on the scene, the ISO should ensure that they are prepared to provide service to responders involved in the incident. The EMS crews should get out of their vehicles and watch for responders who are too fatigued to continue working. The ISO should attempt to secure the help of higher-level EMS providers such as paramedics, since personnel with that level of training could provide the highest level of care for responders who may be injured.

PREINCIDENT PLANNING

There is no better source of information on the hazards presented by a particular occupancy and structure than the preincident planning visit. These visits allow fire companies to tour the structure prior to the emergency, in daylight conditions. If the occupancy is active, representatives of the business can provide valuable information to fire company members during the tours.

Communicating the findings of a preincident visit to a particular occupancy to other responders is the key to maximizing the beneficial impact of the visit. A short written report of the hazards discovered during the visit should be prepared and shared with responders that were not involved in the visit, such as members of other shifts in career departments and volunteer members who did not attend the visit.

Highly detailed plans on how an incident will be processed are most often of little value. A giant binder riding between the driver and officer that is filled with preincident plans that specify where each piece of responding apparatus will park will likely stay safely in the cab when the emergency occurs. Preincident plans should be summarized on a standard form which allows responders to get the information that they need during the few minutes that will pass as they travel from the fire station to the incident scene.

PERSONNEL ACCOUNTABILITY SYSTEM

NFPA 1500 requires the establishment of a written Standard Operating Procedure (SOP) for a personnel accountability system that meets the requirements of NFPA 1561, *Standard on Emergency Services Incident Management System*. The accountability requirements of the 2000 edition of the Standard are

- The system must be used at all incidents. "Saving" the system for use at the "big one" ensures that very few responders will be familiar with it and implementation will be difficult. If the system is used on all incidents, it will become second nature to responders and the implementation of the system will become part of the routine.

- In the case of the fire service, the fire department must develop the system components that are required to make the system effective. Examples of system components are passports, name tags, electronic tracking devices, timers, specialized clipboards, etc.

- The accountability SOP must provide for the use of additional accountability officers based on the size and complexity of the incident. Complex incidents or incidents that occur over large areas are beyond the ability of one person to manage.

- When assigned as a company/crew, members must remain under the supervision of their assigned supervisor. Crew integrity, staying together, under the control of an officer promotes safety and accountability--freelancing is not good for accountability.

- Members must follow the accountability system. Most systems depend on the active participation of all members, you don't have to be very smart to defeat most accountability systems but you are not very smart if you try--the system is in place to help increase the level of safety for responders.

RAPID INTERVENTION CREWS

Rapid Intervention Crews (RIC's) are formed to facilitate the rescue of firefighters who become trapped inside of the hazard zone at an incident. They may be called RIC's, Rapid Intervention Teams (RIT's), Firemens Assistance Search Teams (FAST) companies, or many other names but the mission is the same. The use of RIC's is required in NFPA 1500.

RIC's must be equipped with all the PPE and tools that they may need to enter the hazard zone and perform a rescue. The crew must be composed of at least two members. Experience in Phoenix, Arizona, and other cities has shown that many more than two firefighters will be needed to effect the rescue of a firefighter in trouble.

The staffing and makeup of an RIC is permitted to be flexible based on the type, size, and complexity of the incident. Early in the incident when few firefighters are on the scene, the members of the RIC are permitted to perform other tasks on the fireground unless leaving those tasks to enter the hazard area would create an additional danger to responders.

When the incident escalates beyond the initial assignment of firefighters to the scene, a dedicated RIC must be established. During all special operations incidents, an RIC must be designated. Depending upon the type of hazards present, these firefighters may need to be supplied with specialized equipment or higher levels of protective clothing to allow them to enter the hazard zone at a special operations incident.

RISKS

Acceptable Risks

Emergency response personnel are action oriented. The excitement and challenges in emergency services draw people who are willing to take risks. Fire, EMS, and other emergency service providers routinely accept risks that members of the general public would find too intense. The acceptance of higher levels of risk does not mean that responders should

lay their lives on the line in every situation. Risks to responders are minimized by the provision of training, protective clothing and equipment, SOP's, ICS, and use of ISO's.

Risk Management Plan

A Risk Management Plan is a tool for determining which risks are acceptable. Each action on the emergency scene carries with it a benefit and a risk. Acceptable risks are those where the benefit is of more importance or value than the negative possibilities posed by the risk. A simple risk management test can be used to help the ISO evaluate risks that are not specifically addressed in the agency's Risk Management Plan. Although the criteria may sound simple, the decisions made using them are by no means simple.

- Emergency responders may risk their lives in a calculated manner to save a life.

- Emergency responders may place themselves in situations with moderate risk to save property.

- Emergency responders will risk nothing to save lives that already have been lost or property that already has been destroyed.

The International Association of Fire Chiefs (IAFC) developed *The 10 Rules of Engagement for Structural Fire Fighting and the Acceptability of Risk*, which provides an overview of risk assessment for structural fires. The entire publication can be found at the end of this unit. Figure 6-1 summarizes the rules and risk assessment.

Acceptability of Risk

1. No building or property is worth the life of a firefighter.
2. All interior firefighting involves an inherent risk.
3. Some risk is acceptable, in a measured and controlled manner.
4. No level of risk is acceptable where there is no potential to save lives or savable property.
5. Firefighters shall not be committed to interior offensive firefighting operations in abandoned or derelict buildings.

Risk Assessment

1. All feasible measures shall be taken to limit or avoid risks through risk assessment by a qualified officer.
2. It is the responsibility of the incident commander to evaluate the level of risk in every situation.
3. Risk assessment is a continuous process for the entire duration of each incident.
4. If conditions change, and risk increases, change strategy and tactics.
5. No building or property is worth the life of a firefighter.

Source: International Association of Fire Chiefs

Figure 6-1
10 Rules of Engagement for Structural Firefighting

Unacceptable Risks

Some risks are clearly unacceptable, even for emergency responders. This fact should be addressed in the response agency's risk management plan. The fire department HSO has the primary responsibility for developing and administering this plan. However, it is the ISO on every incident who must interpret and apply it. Therefore, members of the organization who may serve as an ISO should have input into the plan's development.

When a Risk is Unacceptable

There is no reason to risk the life of an EMS responder in a situation where the injured person is inaccessible because of gunfire or some other extreme hazard. There is no reason to risk a firefighter's life to mount an interior attack on a fire in an unoccupied building.

Not all risk management decisions are this simple. We live in a complicated world and there is a fine line between an acceptable risk and an unacceptable risk. This line can be blurred further by a lack of or bad information about the situation.

Most command decisions are made with the best information available at the time and a full awareness of the risks. However, in some cases the IC makes a tactical decision without being aware of all of the risks. In some situations, the IC decides to take a significant risk because of the significant benefit that will occur if the decision pays off. The ISO must continuously evaluate the situation to ensure that the IC is aware of the risks of an operation and the consequences if something goes wrong. If the ISO believes that an operation, or any part of it, presents an unacceptable, imminent danger to responders, he/she has the authority to alter, suspend, or terminate part or all of the operation.

Firefighter Injury/Safety Risk	High Probability of Success	Marginal Probability of Success	Low Probability of Success
Low Risk	Initiate offensive operations. Continue to monitor risk factors.	Initiate offensive operations. Continue to monitor risk factors.	Initiate offensive operations. Continue to monitor risk factors.
Medium Risk	Initiate offensive operations. Continue to monitor risk factors. Employ all available risk control options.	Initiate offensive operations. Continue to monitor risk factors. Be prepared to go defensive if risk increases.	Do not initiate offensive operations. Reduce risk to firefighters and actively pursue risk control options.
High Risk	Initiate offensive operations only with confirmation of realistic potential to save endangered lives.	Do not initiate offensive operations that will put firefighters at risk for injury or fatality.	Initiate defensive operations only.

Terminating Unsafe Operations

The ISO's authority to alter, suspend, or terminate operations that present an imminent safety hazard to emergency responders is contained in Paragraph 2-5.1 of NFPA 1521, *Standard for Fire Department Safety Officer*, 1997 edition; in paragraph 3-2.2.2 of NFPA 1561, 2000 edition; and Paragraph (q) (3) (viii) of the Occupational Safety and Health Administration (OSHA) *Hazardous Waste Operations and Emergency Response* (HAZWOPER) regulation (Title 29, Code of Federal Regulations (29 CFR) Part 1910.120, Final Rule).

NFPA 1521 reads

> 2-5.1 - At an emergency incident, where activities are judged by the incident safety officer to be unsafe or involve an imminent hazard, the incident safety officer shall have the authority to alter, suspend, or terminate those activities. The incident safety officer shall immediately inform the incident commander of any actions taken to correct imminent hazards at the emergency scene.

NFPA 1561 reads

> 3-2.2.2 – The incident safety officer or assistant incident safety officer(s) shall have the authority to immediately correct situations that create an imminent hazard to responders.

The OSHA HAZWOPER regulation reads

> (q) (3) (viii) - When activities are judged by the safety official to be an IDLH (Immediately Dangerous to Life and Health) and/or to involve an imminent danger condition, the safety official shall have the authority to alter, suspend, or terminate those activities. The safety official shall immediately inform the individual in charge of the ICS (Incident Command System) of any actions needed to be taken to correct these hazards at the emergency scene. (Parenthetical phrases added for explanation.)

While the ISO does have the authority to alter, suspend, or terminate an activity, this authority must be balanced with the need to protect the lives of responders and the ISO's role in the ICS. The ISO is a support officer for the IC. In most cases when the ISO identifies a safety risk, minor action will address the problem (e.g., asking a responder to wear gloves; coordinating the establishment of a collapse zone with a sector officer).

The need to terminate an operation without first consulting with a sector officer or the IC is extremely rare and reserved for hazards that place responders in imminent danger.

The decision to terminate, suspend, or alter an operation or a part of an operation must not be taken lightly. The ISO must consider the impact of this action on the rest of the emergency operation. Termination of one part of an operation may place responders operating in other areas of the emergency in great danger. The ISO must relay the decision to terminate an operation to the IC as soon as possible.

The ISO must be able to defend the action to the IC if he/she independently decides to terminate, suspend, or alter a significant part of an operation. Because the ISO is a support officer, the IC may choose to reverse the decision and continue an operation. It is in the best interest of the ISO, the IC, and the responders to keep communications between the ISO and the IC positive and supportive rather than confrontational.

The ISO cannot engage in hours of discussion and consideration but must make sure that the decision is valid. If time permits, he/she should consult face-to-face with the IC prior to terminating an operation. These decisions tend to be significant events and remembered for a long time by both the IC and the ISO. However, the ISO must remember his/her primary function is ensuring responder safety; future career considerations are secondary.

SUMMARY

The ISO is the onscene risk manager. The ISO uses the agency risk management plan, risk management techniques, training, experience, safety cues, and intuition to perform his/her job. While the ISO has a responsibility for the safety of responders, he/she must operate as a support officer for the IC. The ISO must look for immediate risks and forecast risks that may threaten the safety of responders. The ISO has the authority to alter, suspend, or terminate an unsafe operation. Good communication between the ISO and the IC helps assure the safety of responders.

Activity 6.1

Immediate Risks

Purpose

To identify immediate risks posed to responders.

Directions

1. Work in your assigned small groups. You will have 10 minutes to complete the activity.

2. View the slides and identify immediate risks to the responders pictured, or to responders who may soon arrive at the emergency depicted.

3. Prepare a list of the risks that you and the members of your group discuss.

4. Prioritize the risks and appoint a spokesperson to present the five most severe risks identified by your group.

Extrication: _____

_____

_____

_____

_____

_____

Smoky house fire: _____

_____

_____

_____

_____

_____

Car fire: _____

_____

_____

_____

_____

_____

House fire through the roof: _____

Firefighters at vent hole with fire: _____

Shed fire overhaul: _____

Sparks overhead: _____

Firefighter on wood shingle roof: _____

Activity 6.2

Risk Forecasting

Purpose

To forecast risks to emergency responders.

Directions

1. Work in your assigned small groups. You will have 10 minutes to complete the activity.

2. View the slides and forecast risks to responders. Be sure to concentrate your discussions on risks that may occur in the future, not those immediate risks that may be present in the slide.

3. Prepare a list of the forecasted risks that you and the members of your group discuss.

4. Prioritize the risks and appoint a spokesperson to present the five most severe risks identified by your group.

Large house fire: _____

_____

_____

_____

_____

_____

Freeway extrication in the snow: _____

_____

_____

_____

_____

_____

Smokey two-story house fire: _____

_____

_____

_____

_____

Commercial building fire: _____

Storage center fire: _____

House fire with fire through windows: _____

Muffler shop fire: _____

Fuel tanker fire: _____

Activity 6.3

Terminating Unsafe Operations

Purpose

To determine the need to terminate operations that present an imminent risk to responders and to be able to communicate those decisions effectively to the IC.

Directions

1. You will view video scenarios. This is a large group exercise.

2. As you view the video, observe the actions of the responders and look for immediate risks that would require the intervention of an ISO.

3. When you see a situation that demands an immediate stop to assure responder safety, speak up! The instructor will stop the video and you will have the opportunity to explain your decision.

4. As you explain your decision to terminate the operation, use the words that you would use to communicate your decision to the IC.

5. Once the explanation of a terminated operation is completed, the instructor will allow the video to proceed so that other hazards may be viewed.

Scenario 1:

_____
_____
_____
_____

Scenario 2:

_____
_____
_____
_____

Scenario 3:

_____
_____
_____
_____

Scenario 4:

Scenario 5:

Scenario 6:

Scenario 7:

Scenario 8:

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APPENDIX

The 10 Rules of Engagement For Structural Fire Fighting

and the Acceptability of Risk

Prepared by the
ICHIEFS Health and Safety Committee
August, 2001

ACCEPTABILITY OF RISK

All fire fighting and rescue operations involve an inherent level of risk to firefighters.

- A basic level of risk is recognized and accepted, in a measured and controlled manner, in efforts that are routinely employed to save lives and property. ***These risks are not acceptable in situations where there is no potential to saves lives or property.***

- A higher level of risk is acceptable only in situations where there is a ***realistic potential*** to save known endangered lives. This elevated risk must be limited to operations that are ***specifically directed toward rescue*** and where there is ***realistic potential to save the person(s) known to be in danger.***

RULES OF ENGAGEMENT FOR STRUCTURAL FIREFIGHTING

All structural fire fighting operations involve an inherent level of risk to fire fighters. All feasible measures shall be taken to limit or avoid these risks through risk assessment, constant vigilance and the conscientious application of safety policies and procedures.

- The exposure of fire fighters to an elevated level of risk is acceptable only in situations where there is a realistic potential to save known endangered lives.

- ***No property is worth the life of a fire fighter.***

- ***No risk to the safety of a fire fighters is acceptable in situations where there is no possibility to save lives or property.***

- Fire fighters shall not be committed to interior offensive fire fighting operations in abandoned or derelict buildings that are known or reasonably believed to be unoccupied.

RISK ASSESSMENT

It is the responsibility of the incident commander to evaluate the level of risk in every situation. This risk evaluation shall include an assessment of the presence, survivabiltity and potential to rescue occupants. When there is no potential to save lives, firefighters shall not be committed to operations that present an elevated level of risk.

An incident command system shall be established, beginning with the arrival of the first fire department member at the scene of every incident. The incident commander must conduct an initial risk analysis to consider the risk to fire fighters in order to determine the strategy and tactics that will be employed.

The responsibilty for risk assessment is a continuous process for the entire duration of each incident. The incident commander shall continually reevaluate conditions to determine if the level of risk has changed and a change in strategy or tactics is necessary. The incident commander shall assign one or more safety officers to monitor and evaluate conditions to support this risk analysis.

At a minimum the risk analysis for a structure fire shall consider:

Building Charteristics

- Construction type and size
- Structural condition
- Occupancy and contents

Fire Factors

- Location and extent of the fire
- Estimated time of involvement
- What are smoke conditions telling us?

Risk to Building Occupants

- Known or probable occupants
- Occupant survival assessment

Fire Fighting Capabilities

- Available resources
- Operational capabilities and limitation

Acceptability of Risk

1. No building or property is worth the life of a firefighter.
2. All interior firefighting involves an inherent risk.
3. Some risk is acceptable, in a measured and controlled manner.
4. No level of risk is acceptable where there is no potential to save lives or savable property.
5. Firefighters shall not be committed to interior offensive firefighting operations in abandoned or derelict buildings.

Risk Assessment

1. All feasible measures shall be taken to limit or avoid risks through risk assessment by a qualified officer.
2. It is the responsibility of the incident commander to evaluate the level of risk in every situation.
3. Risk assessment is a continuous process for the entire duration of each incident.
4. If conditions change, and risk increases, change strategy and tactics.
5. No building or property is worth the life of a firefighter.

Risk Assessment/Rules of Engagement			
Fire Fighter Injury/ Life Safety Risk	High Probability of Success	Marginal Probability of Success	Low Probability of Success
Low Risk	Initiate offensive operations. Continue to monitor risk factors.	Initiate offensive operations. Continue to monitor risk factors.	Initiate offensive operations. Continue to monitor risk factors.
Medium Risk	Initiate offensive operations. Continue to monitor risk factors. Employ all available risk control options.	Initiate offensive operations. Continue to monitor risk factors. Be prepared to go defensive if risk increases.	Do not initiate offensive operations. Reduce risk to fire fighters and actively pursue risk control options.
High Risk	Initiate offensive operations only with confirmation of realistic potential to save endangered lives.	Do not initiate offensive operations that will put fire fighters at risk for injury or fatality.	Initiate defensive operations only.

NOTE-TAKING GUIDE

Slide 6-1

UNIT 6: OPERATIONAL RISK MANAGEMENT

Slide 6-1

Slide 6-2

TERMINAL OBJECTIVE

At the conclusion of this unit, the students will be able to apply risk management principles to emergency operations.

Slide 6-2

Slide 6-3

ENABLING OBJECTIVES

The students will:

- **Discuss pre-emergency risk control measures.**
- **Given photographs of an emergency incident and working in small groups, identify immediate risks to responders.**

Slide 6-3

Slide 6-4

ENABLING OBJECTIVES (cont'd)

- **Given photographs of an emergency incident and working in small groups, forecast potential risks to responders.**
- **Discuss the importance of recognizing low-frequency/high-severity incidents.**

Slide 6-4

Slide 6-5

ENABLING OBJECTIVES (cont'd)

- **Discuss the difference between pre-emergency and operational risk management.**
- **Given video segments, identify immediate hazards; determine the need and the method to terminate unsafe operations.**

Slide 6-5

Slide 6-6

INTRODUCTION

- **"Show time"**
- **Pre-emergency risk management done**
- **Health and Safety Officer (HSO) can't be at every incident**
- **Incident Safety Officer (ISO) can be assigned at the scene**

Slide 6-6

Slide 6-7

THE INCIDENT SAFETY OFFICER'S ROLE IN EMERGENCY RISK MANAGEMENT

- **Pre-emergency risk management measures in place**
  - **Safety equipment in use**
  - **Proper procedures followed**
- **Survey the scene**

Slide 6-7

Slide 6-8

THE INCIDENT SAFETY OFFICER'S ROLE IN EMERGENCY RISK MANAGEMENT (cont'd)

- **ISO is one safety role, everyone has one.**
- **The Incident Commander (IC) depends on the ISO to monitor safety.**
  - **Not a safety cop.**
  - **Not a game.**

Slide 6-8

Slide 6-9

THE INCIDENT SAFETY OFFICER'S ROLE IN EMERGENCY RISK MANAGEMENT (cont'd)

- **The ISO's only job is safety.**
- **Must be mobile.**
- **Assignment of other tasks inappropriate.**
- **ISO must look for immediate risks and evaluate the scene for potential risks.**

Slide 6-9

Slide 6-10

THE INCIDENT SAFETY OFFICER'S KNOWLEDGE OF RISKS

- **Agency procedures**
- **ISO not usually designated beforehand**
- **Safety focus**
- **Rely on training, experience, safety cues, and intuition**

Slide 6-10

Slide 6-11

Activity 6.1
Immediate Risks

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FORECASTING

- **Emergency scenes are dangerous and change rapidly.**
- **ISO must monitor immediate risks and situations that may become dangerous.**
- **The ISO must forecast risks.**
- **Not 100-percent reliable.**

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STRUCTURAL FORECASTING TOOLS

- **The features of the fire building**
- **Fire protection systems**
- **Access for fire crews**
- **Egress for crews working on the interior**
- **Construction type**
- **The age of the fire building**

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STRUCTURAL FORECASTING TOOLS (cont'd)

- The potential for extension
- Amount of fire involvement
- Roof hazards
- Time
- The IC's tactical objectives
- The weather

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MEDICAL EMERGENCY FORECASTING TOOLS

- Protection from communicable diseases
- Protection from physical hazards
- Violent acts
- Protection from surroundings
- Sufficient staffing

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SPECIAL OPERATIONS FORECASTING TOOLS

- Incident duration--longer
- Technical experts
- Rescue teams, properly equipped
- Time less of a factor
- Passage of time may drop guard

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TERRORISM AND WEAPONS OF MASS DESTRUCTION FORECASTING TOOLS

- **Terrorism threat level**
- **Who's in the building?**
- **Number of responders**
- **Secondary device**

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EMERGENCY MEDICAL SUPPORT

- **Forecast the need**
- **May be required by NFPA 1500**
- **Prompt the IC that Advanced Life Support (ALS) preferred**
- **Once on scene**
  - **Get out of the vehicle**
  - **Assess responders**
  - **Stay at hand**

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Activity 6.2
Risk Forecasting

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PREINCIDENT PLANNING

- One of the best risk management tools
  - Daylight
  - Information from occupants
- Communication to other firefighters
- Highly detailed plans usually not of much value
- Standard, simple form
- NFPA 1620, excellent reference

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PERSONNEL ACCOUNTABILITY SYSTEM

Required by NFPA 1500

- Used at all incidents
- System components
- Accountability Standard Operating Procedure (SOP)
- Complex incidents
- Remain together
- Follow the system

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RAPID INTERVENTION CREWS

- Required by NFPA 1500
- Equipped properly
- Flexible staffing
  - Are two members sufficient?
- Dedicated crew upon escalation
- Special operations

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VIDEO:

"Fire Critique--Phoenix Fire Department 22nd Street and Thomas Road"

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ACCEPTABLE RISKS

- **Accept risks that would not be acceptable to nonfirefighters**
- **Minimized by training, personal protective equipment (PPE), SOP's, Incident Management System (IMS), and ISO's**
- **Active, written Risk Management Plan**

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RISK MANAGEMENT PLAN

- **Emergency responders may risk their lives in a calculated manner to save a life.**
- **Emergency responders may place themselves in situations with moderate risk to save property.**
- **Emergency responders will risk nothing to save lives that are already lost or property that already has been destroyed.**

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RISK MANAGEMENT

International Association of Fire Chiefs (IAFC)--*The 10 Rules of Engagement for Structural Fire fighting and the Acceptability of Risk*

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UNACCEPTABLE RISKS

- **Clearly unacceptable**
- **Not always cut and dry**
- **IC may not be aware of risk**
- **Situation may have changed**

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TERMINATING UNSAFE OPERATIONS

- **ISO authority in NFPA 1521, NFPA 1561, and Occupational Safety and Health Administration's Hazardous Waste Operations and Emergency Response (OSHA HAZWOPER)**
- **The ISO works for the IC**

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TERMINATING UNSAFE OPERATIONS (cont'd)

- **Rarely used**
- **Most often minor correction needed**
- **Impact on the rest of the incident operations**
- **Communication with the IC**
- **Responder safety is paramount**

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Activity 6.3
Terminating Unsafe Operations

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SUMMARY

- **ISO is the onscene risk manager**
- **ISO background and experience**
- **Immediate risks**
- **Forecasted risks**
- **Terminating unsafe operations**
- **Communication between ISO and IC**

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UNIT 7: PROCESS APPLICATION

TERMINAL OBJECTIVE

The students will be able to identify the knowledge and skills needed to perform the duties of the Incident Safety Officer (ISO) during incident operations and training evolutions.

ENABLING OBJECTIVES

The students will:

1. *Discuss the philosophy of this course.*

2. *Discuss why it is important for all members of an organization to understand this philosophy.*

SUMMARY/CONCLUSION

The goal of this course is to ensure that the Incident Safety Officer (ISO) "weaves safety into the current fabric of the organization." The subject matter covered in this course will provide the student with a basic foundation to function as an ISO.

There is one component that this course, unfortunately, can't provide: experience. A member of a fire department designated as the ISO must have the experience and intuition to understand the operations of an incident. Moreover, such members must have a thorough understanding of the Incident Command System (ICS) used by their department. Once a member has these items in his/her personal toolbox, he/she will be a valuable resource to the department as an ISO.

In order to develop and implement an effective ISO process, the department must understand the issues and how they can be corrected. NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program,* and NFPA 1521, *Standard for Fire Department Safety Officer,* are two excellent resources to use as an evaluation of the current process.

The development of an operational Risk Management Plan should be started as soon as possible. This process needs to be incorporated into the department's ICS procedures. NFPA 1561, *Standard on Emergency Services Incident Management System,* is the vital resource.

This is not a process that will occur overnight. The department will respond to "working" incidents, use the ISO, and then evaluate the effectiveness of the program. The goal is to improve the safety and health of firefighters when operating at an emergency incident.

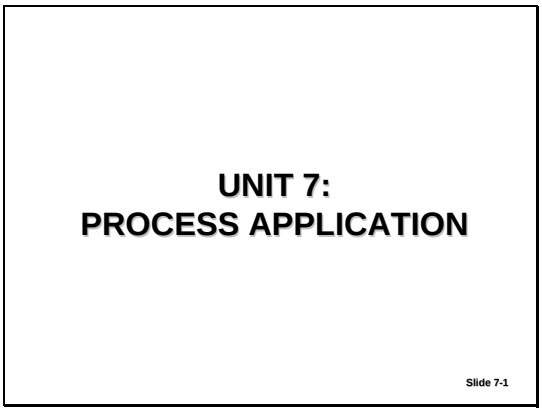
Course philosophy: Weave safety into the current fabric of the organization.

The topics covered during this course:

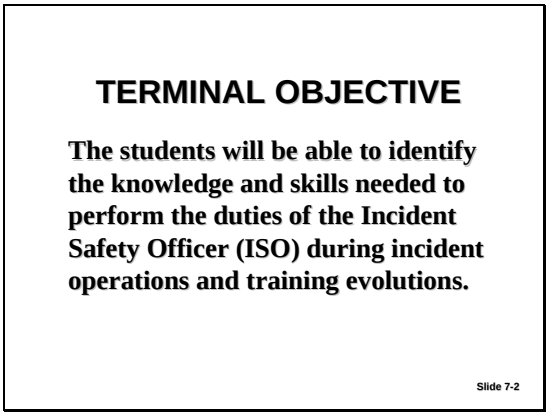
- firefighter fatalities and injuries;
- risk management principles;
- safety responsibilities;
- current issues; and
- operational risk management.

NOTE-TAKING GUIDE

Slide 7-1



Slide 7-2



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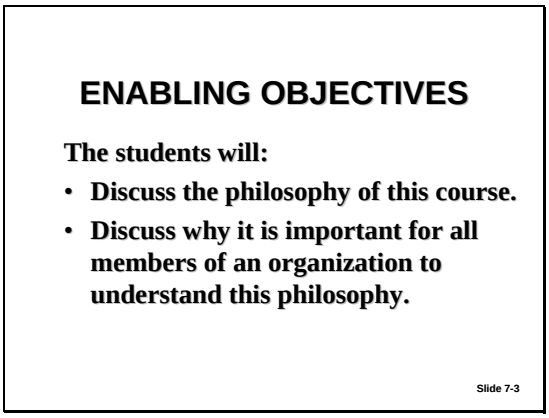

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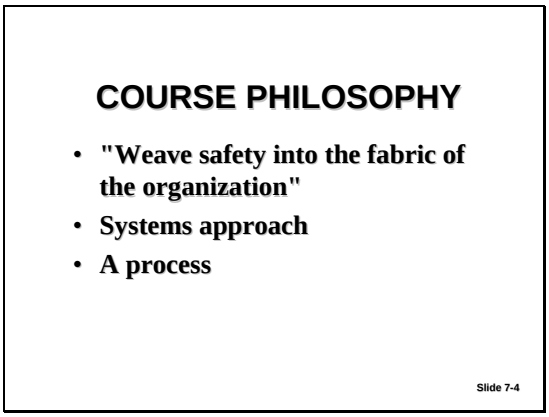

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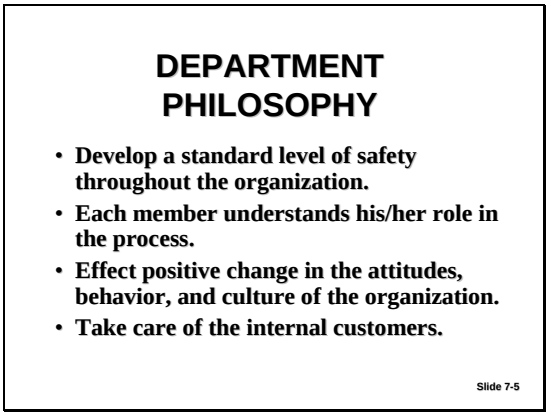

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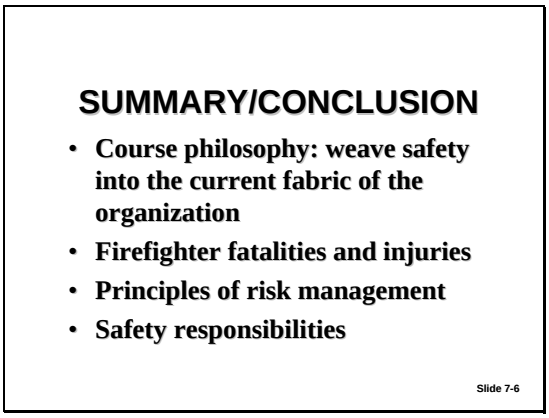

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SUMMARY/CONCLUSION (cont'd)

- **Current issues**
- **Operational risk management**

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APPENDIX A

SOURCES OF ADDITIONAL INFORMATION

United States Fire Administration
16825 South Seton Avenue
Emmitsburg, MD 21727
(800) 238-3358
http://www.usfa.fema.gov

National Fire Academy
16825 South Seton Avenue
Emmitsburg, MD 21727
(800) 238-3358
http://www.usfa.fema.gov/dhtml/fire-service/nfa.cfm

Learning Resource Center
National Emergency Training Center
16825 South Seton Avenue
Emmitsburg, MD 21727
(800) 638-1821
http://www.lrc.fema.gov

Occupational Safety and Health Administration
Publication Information (202) 219-9631
Public Information (202) 219-8151
or contact your local office
http://www.osha.gov

Centers for Disease Control and Prevention
1600 Clifton Road, N.E.
Atlanta, GA 30333
(404) 639-3311
http://www.cdc.gov

National Institute for Occupational Safety and Health
Appalachian Laboratory for Occupational Safety and Health
944 Chestnut Ridge Road
Morgantown, WV 36505
(800) 356-4674
http://www.cdc.gov/niosh/homepage.html

U.S. Government Printing Office
Superintendent of Documents
Washington, DC 20402
(202) 512-1800
http://www.access.gpo.gov

National Fire Protection Association
1 Batterymarch Park
P.O. Box 9101
Quincy, MA 02269
(617) 770-3000
http://www.nfpa.org

International Association of Fire Fighters
Occupational Safety and Health Department
1750 New York Avenue, N.W.
Washington, DC 20006-5395
(202) 737-8484
http://www.iaff.org

International Association of Fire Chiefs
Health and Safety Committee
4025 Fair Ridge Drive
Fairfax, VA 22033
http://www.iafc.org

National Safety Council
1121 Spring Lake Drive
Itasca, IL 60143-3201
(630) 285-1121
http://www.nsc.org

Fire Department Safety Officers Association
P.O. Box 149
Ashland, MA 01721
(508) 881-3114
http://www.fdsoa.org

APPENDIX B

FIREFIGHTER SAFETY AND HEALTH STANDARDS AND REGULATIONS

NFPA Standards	
NFPA 403	Standard for Aircraft Rescue and Fire Fighting Services at Airports (1998)
NFPA 472	Standard for Professional Competence of Responders to Hazardous Materials Incidents (1997)
NFPA 1001	Standard for Fire Fighter Professional Qualifications (1997)
NFPA 1002	Standard for Fire Apparatus Driver/Operator Professional Qualifications (1998)
NFPA 1021	Standard for Fire Officer Professional Qualifications (1997)
NFPA 1201	Standard for Developing Fire Protection Services for the Public (2000)
NFPA 1221	Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems (1999)
NFPA 1250	Recommended Practice in Emergency Service Organization Risk Management (2000)
NFPA 1403	Standard on Live Fire Training Evolutions (2002)
NFPA 1404	Standard for Fire Service Respiratory Protection Training (2002)
NFPA 1500	Standard on Fire Department Occupational Safety and Health Program (2002)
NFPA 1521	Standard for Fire Department Safety Officer (1997)
NFPA 1561	Standard on Emergency Services Incident Management System (2002)
NFPA 1581	Standard on Fire Department Infection Control Program (2002)
NFPA 1582	Standard on Comprehensive Occupational Medical Program for Fire Departments (2003)
NFPA 1583	Standard on Health Related Fitness Programs for Fire Fighters (2000)
NFPA 1584	Recommended Practice on the Rehabilitation for Members Operating at Incident Scene Operations and Training Exercises (2003)
NFPA 1851	Standard on Selection, Care, and Maintenance of Structural Fire Fighting Protective Ensembles (2001)
NFPA 1901	Standard for Automotive Fire Apparatus (1999)
NFPA 1911	Standard for Service Tests of Fire Pump Systems on Fire Apparatus (1997)
NFPA 1912	Standard for Fire Apparatus Refurbishing (2001)
NFPA 1914	Standard for Testing Fire Department Aerial Devices (1997)
NFPA 1915	Standard for Fire Apparatus Preventive Maintenance Program (2000)
NFPA 1931	Standard on Design of and Design Verification Tests of Fire Department Ground Ladders (1999)
NFPA 1932	Standard on Use, Maintenance, and Service Testing of Fire Department Ground Ladders (1999)
NFPA 1936	Standard on Powered Rescue Tool Systems (1999)
NFPA 1961	Standard for Fire Hose (2002)
NFPA 1962	Standard for the Inspection, Care and Use of Fire Hose, Couplings and Nozzles; and the Service Testing of the Fire Hose
NFPA 1971	Standard on Protective Ensemble for Structural Fire Fighting (2000)
NFPA 1975	Standard on Station/Work Uniforms for Fire and Emergency Services (1999)

NFPA 1976	Standard on Protective Ensemble for Proximity Fire Fighting (2000)
NFPA 1977	Standard on Protective Clothing and Equipment for Wildland Fire Fighting (1998)
NFPA 1981	Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire and Emergency Services (1997)
NFPA 1982	Standard on Personal Alert Safety Systems (PASS) (1998)
NFPA 1983	Standard on Fire Service Life Safety Rope and System Components (2001)
NFPA 1991	Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies (2000)
NFPA 1992	Standard on Liquid Splash-Protective Ensembles and Clothing for Hazardous Materials Emergencies (2000)
NFPA 1994	Standard on Protective Ensembles for Chemical/Biological Terrorism Incidents (2001)
NFPA 1999	Standard on Protective Clothing for Emergency Medical Operations (1997)
Department of Labor, Occupational Safety and Health Administration	
1910.95	Occupational Noise Exposure
1910.120	Hazardous Waste and Emergency Operations
1910.1030	Occupational Exposure to Bloodborne Pathogens
1910.134	Respiratory Protection
1910.146	Permit-Required Confined Spaces
1910.156	Fire Brigades
1910.133	Eye and Face Protection
1910.20	Access to Employees Exposure and Medical Records
American National Standards Institute (ANSI)	
ANSI/CGA G7.1	Commodity Specifications for Air (1989)
ANSI/Z87.1	Practice for Occupational and Educational Eye and Face Protection (1989)

APPENDIX C

EVALUATION OF YOUR OWN DEPARTMENT'S INCIDENT SAFETY OFFICER PROGRAM

Evaluation of Your Own Department's Incident Safety Officer Program

Incident Safety Program	YES	NO	COMMENTS
My department has a written Incident Command System (ICS) that complies with NFPA 1561.			
My department uses an ICS that complies with NFPA 1561 at all incidents.			
My department has developed a Response Matrix (Plan) for the Incident Safety Officer (ISO) **OR**			
My department has a Standard Operating Procedure (SOP) for the appointment of an ISO.			
My department uses an Operational Risk Management Plan.			
My department has an SOP for the establishment of an Incident Scene Rehabilitation Program.			
My department has an SOP that defines the ISO duties and responsibilities per NFPA 1521.			
My department uses a Personnel Accountability System at all incidents.			
The Incident Commander (IC) issues the ISO an Incident Action Plan (IAP) as needed.			
The ISO provides the IC with a risk assessment of incident scene operations.			

Incident Safety Program	YES	NO	COMMENTS
The ISO evaluates traffic hazards and apparatus placement, and takes appropriate actions to mitigate hazards.			
The ISO monitors radio communications.			
The ISO advises the IC of the need for Assistant Incident Safety Officers.			
The ISO evaluates the hazards associated with the landing zone and interface with helicopters.			
The ISO evaluates smoke and fire conditions during fire-fighting operations.			
Incidents involving EMS operations meet the requirements of NFPA 1581.			
The ISO meets the requirements of NFPA 1500/NFPA 1521 for Special Operations.			
My department has a SOP in place to ensure that the ISO investigates accidents, injuries, and exposures associated with emergency operations.			
The ISO is involved in the Post-Incident Analysis (PIA) process.			