California Specialized Training Institute

Assistant Safety Officer-Hazardous Materials

PARTICIPANT GUIDE

2019



Photo by Robert Eplett, CalEMA

California Specialized Training Institute
P.O. Box 8123
San Luis Obispo,
CA 93405-7605
www.csti.ca.gov

California Specialized Training Institute - CSTI

California Specialized Training Institute

Assistant Safety Officer-Hazardous Materials

PARTICIPANT GUIDE

California Specialized Training Institute
P.O. Box 8123
San Luis Obispo, CA 93403-8123
www.csti.ca.gov
www.oes.ca.gov

2019

California Governor's Office of Emergency Services

Assistant Safety Officer-Hazardous Materials: Participant Guide
May be used for training, not for commercial use.
Copyright 2019 State of California

Printed in the United States of America
10 9 8 7 6 5 4 3 2 1
ISBN 13: 978-1-57931-109-4
Cover photo: Robert Eplett, CalEMA



Design by ToucanEd Inc.
1280 17th Ave., Suite 102
Santa Cruz, CA 95062
(831) 464-0508
www.toucaned.com

Table of Contents

Course Description vii
- Course Overview vii
- Mission Area vii
- Scope viii
- Target Audience x
- Prerequisites x
- Duration/Course Length x
- Required Materials/Facilities x
- Testing and Certification xi
- Reference List xi
- Evaluation Strategy xii

Chapter 1 An Introduction to the Assistant Safety Officer-Hazardous Materials
- Lesson Administrative Page (LAP) 1
- Supporting Materials/Resources 17

Chapter 2 The Role of the Assistant Safety Officer-Hazardous Materials
- Lesson Administrative Page (LAP) 31
- Supporting Materials/Resources 49
- Practical Exercises 87

Chapter 3 Laws and Regulations
- Lesson Administrative Page (LAP) 123
- Supporting Materials/Resources 139
- Practical Exercises 155

Chapter 4 Operational Risk Management
- Lesson Administrative Page (LAP) 161
- Supporting Materials/Resources 183

Chapter 5 Incident Planning
- Lesson Administrative Page (LAP) 213
- Supporting Materials/Resources 231

Chapter 6 Personnel Monitoring
- Lesson Administrative Page (LAP) 267
- Supporting Materials/Resources 283
- Practical Exercises 307

Chapter 7 Safety Messages, Safety Briefings, and Special Reports
- Lesson Administrative Page (LAP) 311
- Supporting Materials/Resources 321

Chapter 8 Environmental Monitoring
Lesson Administrative Page (LAP) 329
Supporting Materials/Resources 341
Practical Exercises 363

Chapter 9 Decontamination
Lesson Administrative Page (LAP) 367
Supporting Materials/Resources 387

Chapter 10 Safety Issues in Terrorism Response
Lesson Administrative Page (LAP) 401
Supporting Materials/Resources 425

Appendixes

Appendix A Organization, Personnel, Responsibilities and Procedures of the Assistant Safety Officer-Hazardous Materials 443

Appendix B California Code of Regulations: Title–8 Section 5192 of the General Industry Safety Orders 451

Appendix C Sample Standard Operating Procedures for Emergency Incident Rehabilitation 515

Appendix D First Responders' Environmental Liability Due to Mass Decontaminations Runoff 521

Glossary 525

Course description

Course Overview

The overarching goal of this course is to provide hazardous materials responders with the knowledge and skills to become competent Assistant Safety Officers-Hazardous Materials (ASO-HazMat) who have a high regard for safety. The intended outcomes for this course are to ensure that participants will be able to identify, inventory, and analyze the hazards and risks involved in an incident and take appropriate action, either through direct intervention or by contacting the responsible supervisor with recommendations for minimizing risk; assist in the preparation and development of components for event-specific and site-specific plans that involve personnel safety; implement the elements of personnel monitoring to protect hazardous materials responders' health and safety; develop appropriate forms of written and oral safety communication for incident planning and to ensure that on-scene personnel receive critical information about the specific hazards and risks involved in hazardous materials incidents; assess on-scene decontamination procedures in order to protect responder health and safety; and plan a safe hazardous materials response that is consistent with the emergency response plan and the organization at a terrorist incident.

The content for this course describes some of the tools and procedures an ASO-HazMat must be familiar with to carry out the responsibilities of this position; explains how laws, regulations, plans, policies, and standard operating procedures play an important role in ensuring safety during responses to hazardous materials incidents; provides an overview of risk management, describes Operational Risk Management, and introduces forecasting; discusses pre-event, event-specific, and site-specific plans; discusses the role of the ASO-HazMat in on-scene personnel monitoring; addresses the preparation, production, and delivery of safety messages, safety briefings, and special reports; discusses the role of the ASO-HazMat in on-scene environmental monitoring; describes methods and procedures for both responder and victim decontamination; and covers the outward warning signs that chemical, biological, radiological/nuclear, and explosive agents may have been used in a terrorist attack.

In addition to addressing the outcomes and content described above, this course incorporates many opportunities for asking questions and discussing various safety topics. Small-group and independent exercises are structured to reinforce key points. In particular, the class is divided into groups of participants who are assigned to develop a safety briefing based on a specific scenario. Using ICS Forms 206, 208, and 202 (and other ICS forms, as needed), groups develop and deliver to the entire class a safety briefing that includes an overview of the scenario, a medical plan, a site safety plan, and a safety message.

Mission Area

This course addresses the Respond mission area as defined in the *National Preparedness Goal*. Specifically, under Preparedness (A) of the Respond mission area, hazardous materials (HazMat) responders gain the knowledge and skills to assess the incident through:

- investigating the incident
- assessing hazards and consequences
- conducting internal communications

California Specialized Training Institute, 2019

Under Resource Management (B) of the Respond mission area, HazMat responders gain the knowledge and skills to minimize the incident's impact through:

- managing the incident
- responding to the incident
- implementing protective actions
- conducting search and rescue

The information and exercises in this course also support the acquisition of knowledge and skills to enhance onsite incident management, worker health and safety, public safety and security response, explosive device response operations, firefighting operations/support, WMD/hazardous materials response and decontamination, citizen protection (evacuation and/or in-place protection), and search and rescue as identified in the Targeted Capabilities List.

Scope

This course in hazardous materials response for the Assistant Safety Officer complies with requirements for the state of California's Hazardous Substances Incident Response Training and Education Program (Government Code Section 8574). This code requires the California Emergency Management Agency to present to field responders approved training classes, taught by trained instructors, in hazardous substance response. These training classes are to be provided through outreach programs and are to certify participants who have completed these training classes. This training is also mandated by the Occupational Safety and Health Act, Title 29, Code of Federal Regulations 1910.120(q) and the California Code of Regulations Title 8–Section 5192(q). The regulations covering the requirements and course contents are contained in the California Code of Regulations Title 19–Section 2520.

National Fire Protection Association Standard 472

In addition to complying with the state and federal regulations for hazardous materials training mentioned above, this course addresses the core competencies identified in the National Fire Protection Association Standard 472, Competence of Responders to Hazardous Materials and Weapons of Mass Destruction Incidents (NFPA Standard 472). Those NFPA Standard 472 core competencies are

- Analyze a hazardous materials/WMD incident to determine the complexity of the problem in terms of safety by observing a scene and reviewing and evaluating hazard and response information as it pertains to the safety of all persons in the hazardous materials branch/group.
- Assist in planning a safe response within the capabilities of available response personnel, personal protective equipment, and control equipment.
    - Prepare a site safety and control plan.
    - Review an incident action plan and provide recommendations regarding safety components.
    - Select the appropriate level and type of personal protective equipment at a hazardous materials/WMD incident.
    - Evaluate the decontamination plan and make recommendations concerning safety (when provided

California Specialized Training Institute, 2019

with a historical or simulated decontamination scenario).
    - Identify appropriate transportation and medical services at a hazardous materials/WMD incident.
- Ensure the implementation of a safe response consistent with the incident action plan, the emergency response plan, and/or standard operating procedures.
    - Describe the procedures for taking corrective actions when dangerous situations are encountered at a hazardous materials/WMD incident.
    - Conduct safety briefings at a hazardous materials/WMD incident.
    - Describe safety issues in the implementation and enforcement of a site safety and control plan.
    - Demonstrate proper communications during a hazardous materials/WMD incident.
- Evaluate the progress of the planned response to ensure that the response objectives are being met safely.
- Identify and evaluate the incident safety plan and/or incident action plan to detect and recognize deviations from the site safety and control plan and any dangerous situations.

universal Task List

The information, objectives, and activities in this course also promote the acquisition of knowledge and skills in support of numerous target capabilities identified in the Universal Task List (UTL). Those UTLs are

(Res.A.2 1) Establish procedures for the immediate incident scene.

(Res.A.2 1.3.2) Report current monitoring activities and results.

(Res.A.3 3.4) Disseminate information to emergency managers and responders.

(Res.B.1 16.1) Ensure coordination of assets assigned to perform worker safety and health risk assessment and risk management.

(Res.B.1 16.3) Perform ambient and task specific worker exposure monitoring for hazardous substances and inform workers of relevant risks.

(Res.B.1 16.4) Provide review of Occupational Safety and Health Administration requirements to assure they allow operations during a disaster.

(Res.B.1 16.5) Monitor and perform activities related to worker health and safety issues.

(Res.B.2 1.2.2.1) Establish criteria for patient decontamination that fully considers the safety of EMS personnel and hospital-based first responders, knowing up to 80% of all victims will self refer to the nearest hospital.

(Res.B.2 1.3) Develop plans, procedures, and protocols for public safety and security support activities.

(Res.B.2 3.2.1) Coordinate and direct hazardous materials detection and assessment activities.

(Res.B.2 5.1.1) Identify hazardous materials and extent/scope of the incident.

(Res.B.2 5.1.1.4) Conduct contamination surveys.

(Res.B.2 5.1.1.5) Assess hazardous materials release situation.

California Specialized Training Institute, 2019

(Res.B.2 5.1.2) Characterize consequences and risks.

(Res.B.2 5.1.2.3) Develop a contamination site safety plan.

(Res.B.2 5.1.4.1) Develop and implement a site-specific safety and health plan that includes worker risk assessment and risk management.

(Res.B.2 5.1.4.2) Develop an onsite hazardous materials response plan.

(Res.B.2 5.2) Establish and implement on-scene management for Hazmat response utilizing ICS.

(Res.B.2 5.3) Conduct Hazmat response (implement plans, programs, agreements, and requirements).

(Res.B.2 5.4) Ensure the safety of all on-scene responders.

(Res.B.2 5.4.4) Coordinate rescue efforts with law enforcement to ensure safety of rescuers while law enforcement secures incident site.

(Res.B.2 5.5) Conduct decontamination.

Target Audience

The target audiences for this course are fire service, law enforcement, emergency management, emergency medical services, hazardous materials, or any other individuals who, in the course of carrying out their job, may be assigned to the Hazardous Materials Group for the duty of providing safety and risk management supervision.

Prerequisites

This course is intended for those who have been state-certified to the Hazardous Materials Technician/ Specialist level. It is the responsibility of the jurisdiction to determine participants' eligibility for this course.

duration/Course Length

This course has been developed as a 16-hour, instructor-led training delivered over two days.

required Materials/Facilities

- Seating and work stations for up to 30 participants
- Laptop computer, projector, and screen
- Instructor Manual and CD with PowerPoint presentation (1 for instructor)
- Participant Guide (1 for each participant)
- Flip charts and markers for safety briefings
- ICS forms (201: Incident Briefing, 202: Incident Objectives, 206: Medical Plan, 208: Site Safety and Control Plan, and 214: Unit Log)

California Specialized Training Institute, 2019

Testing and Certification

Course completion is based on developing and delivering a safety briefing and passing the final exam with a minimum score of 70 percent. Once participants have successfully taken this course, California Specialized Training Institute (CSTI) issues a Certificate of Completion.

reference List

This section provides the source material upon which this course is based.

Dashiell, Thomas R., Patrick, William C., Sidell, Federick R.. 2003. *Jane's Chem/Bio Handbook.* Jane's Information Group.

Federal Aviation Administration. December 2000. *System Safety Handbook*, Chapter 15: Operational Risk Management. http://www.faa.gov/library/manuals/aviation/risk_management/ss_handbook/media/chap15_1200.pdf

Henry, Timothy V. 1999. *Decontamination for Hazardous Materials Emergencies*, Delmar Publishing http://www.amazon.com/Decontamination-Hazardous-Materials-Emergencies-Timothy/dp/0766806936

National Fire Protection Agency (*NFPA*). *NFPA Form 704 Hazard Identification System.* 1990. Section 704, National Fire Code.

National Institute for Occupational Safety and Health (NIOSH). 2005-149. *Pocket Guide to Chemical Hazards,* U.S. Department of Health and Human Services.

Occupational Safety and Health Administration. November 1983. *Code of Federal Regulations*, *Title 29, Part 1910.120; Hazardous waste operations and emergency response* http://www.gpoaccess.gov/CFR

State of California Office of Emergency Services. 2007. Firefighting Resources of California Organized for Potential Emergencies (FIRESCOPE). *Field Operations Guide, Assistant Safety Officer-Hazardous Materials (ASO-HazMat)* http://www.firescope.org/

U.S. Air Force. 2000. *Air Force Instruction 90-901: Operational Risk Management.* http://www.mitre.org/work/sepo/toolkits/risk/policies/files/afi90-901.pdf

U.S. Army. January 2000. Soldier and Biological Chemical Command (SBCCOM). *Guidelines for Mass Casualty Decontamination during a Terrorist Chemical Agent Incident.* http://www.chem-bio.com/resource/2000/cwirp_guidelines_mass.pdf

U.S. Coast Guard. 1999. *Commandant Instructions 3500.3: Operational Risk Management.* http://www.uscg.mil/directives/ci/3000-3999/CI_3500_3.pdf

U.S. Department of Homeland Security. May 23, 2005. *Universal Task List, Version 2.1.* http://www.ojp.usdoj.gov/odp/docs/UTL2_1.pdf

http://www.fema.gov/pdf/emergency/nims/im-job-titles.pdf

California Specialized Training Institute, 2019

U.S. Department of Transportation (DOT), Transport Canada (TC), Secretariat of Transport and Communications of Mexico (SCT), and collaboration with CIQUIME (Centro de Informaciòn Quìmica para Emergencias) of Argentina. *2008 Emergency Response Guidebook.*

Trainings

California Emergency Management Agency. California Specialized Training Institute, Hazardous Materials Technician and Specialist Training Courses. http://www.homeland.ca.gov/hseep/csti.html

_____. Office of the State Fire Marshal, Safety Officer Training for Command Staff. http://osfm.fire.ca.gov/training/training.php

Evaluation Strategy

This course uses a Level 1 evaluation strategy in the form of a questionnaire to determine learners' reactions to the course and a Level 2 evaluation strategy in the form of a multiple-choice pre/post test to assess learners' proficiency in the knowledge and skills presented.

California Specialized Training Institute, 2019

Course Agenda

Day One

0800–0830	Welcome and Course Overview
	Pre/Post Test
0830–0930	Chapter 1: An Introduction to the Assistant Safety-Officer Hazardous Materials
0930–1140	Chapter 2: Role of the Assistant Safety-Officer Hazardous Materials 1140–
1200	Safety Briefing Project Assignments
1200–1300	Lunch
1300–1415	Chapter 3: Laws and Regulations
1415–1530	Chapter 4: Operational Risk Management
1530–1630	Chapter 5: Incident Planning
1630–1700	Small Groups: Safety Briefing Development

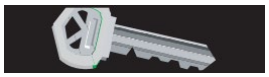
Day Two

0800–0830	Small Groups: Safety Briefing Development (continued from Day One)
0830–0935	Chapter 6: Personnel Monitoring
0935–0945	Safety Briefing Presentations (Case Studies 1 and 2)
0945–1035	Chapter 7: Safety Messages, Safety Briefings, and Special Reports
1035–1045	Safety Briefing Presentations (Case Studies 3 and 4)
1045–1205	Chapter 8: Environmental Monitoring
1205–1215	Safety Briefing Presentations (Case Studies 5 and 6)
1215–1315	Lunch
1315–1435	Chapter 9: Decontamination
1435–1445	Safety Briefing Presentations (Case Studies 7 and 8)
1445–1605	Chapter 10: Safety Issues in Terrorism Response
1605–1615	Safety Briefing Presentations (Case Studies 9 and 10)
1615–1700	Pre/Post Test
	Course Evaluation, Level 1

California Specialized Training Institute, 2019

Icon Map

The following icons are used throughout the Instructor's Manual and Participant Guide to help instructors and learners find key elements in the course. This Icon Map describes the use of each icon.

	**Scope:** A scope statement is provided in each chapter (lesson). It describes the concepts, topics, and skills addressed in the chapter.
	**Time—Instructor/Participant ratio—Method of Instruction:** This icon locates the information for the time needed to complete the lesson, the ratio of instructors needed per participant, and the type of instruction.
	**Terminal Learning Objective (TLO):** Each chapter (lesson) has one TLO that describes the broad goal of the lesson.
	**Enabling Learning Objective (ELOs):** Each chapter (lesson) has several ELOs that describe the incremental learning objectives for the lesson and support the TLO.
	**Materials and Preparation:** This icon highlights the list of facilities, equipment, and materials needed to conduct the lesson. The specific materials that need to be copied are indicated (e.g., Pre/Post Test). The Supporting Materials/Resource List provided at the end of the lesson are listed.
	**Practical Exercises (PEs):** This icon highlights the list of PEs for the lesson and provides the page reference for the instructions to conduct the PE. The PEs reinforce key concepts addressed in the lesson.
	**Instructional Procedures:** This icon indicates where the steps for instruction start in the lesson.

California Specialized Training Institute, 2019

An Introduction to the Assistant Safety Officer-Hazardous Materials



Scope

This chapter provides an overview of the course, introduces the Assistant Safety Officer-Hazardous Materials as a good communicator and effective change agent, and discusses common situations where the risks to responders outweigh the benefits.



Terminal Learning Objectives (TLO)

At the end of instruction for Chapter 1, participants will be able to demonstrate the characteristics of an effective Assistant Safety Officer-Hazardous Materials.



Enabling Learning Objectives (ELOs)

This chapter's enabling learning objectives are to ensure participants will be able to:

1. Describe the core competencies of an effective Assistant Safety Officer-Hazardous Materials.
2. Describe the steps for achieving change.
3. List the characteristics of an effective ASO-HazMat.
4. Recognize common conditions that pose dangers to responders during a hazardous materials incident.

Supporting Materials/resource List

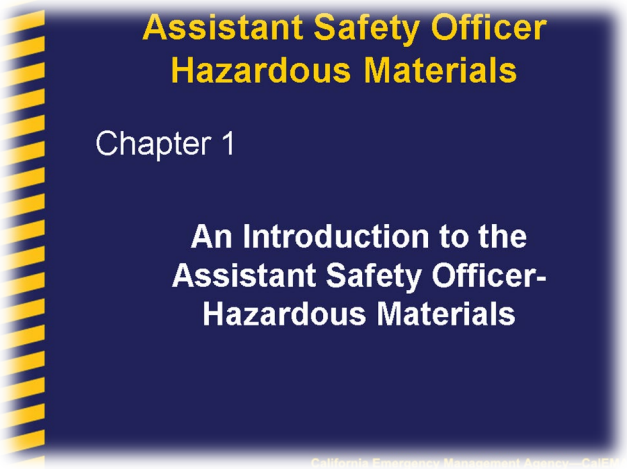
See Supporting Materials/Resource List section starting on page 17.



Practical Exercises

Note: No exercises are scheduled for this introductory chapter.

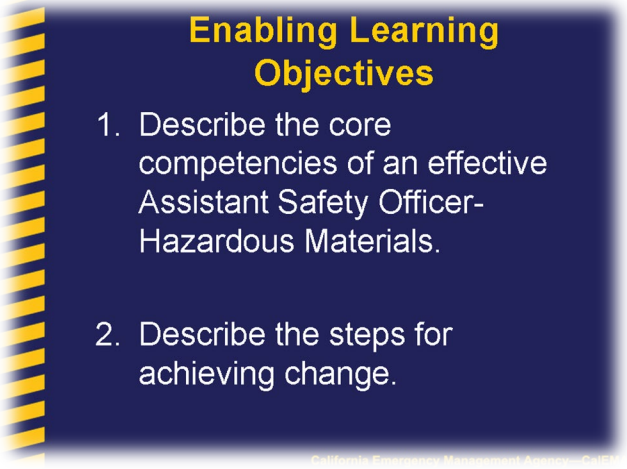
California Specialized Training Institute, 2019



Slide 1.1

The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

- (Res.A.2 1) Establish procedures for the immediate incident scene.
- (Res.B.2 5.4) Ensure the safety of all on-scene responders.

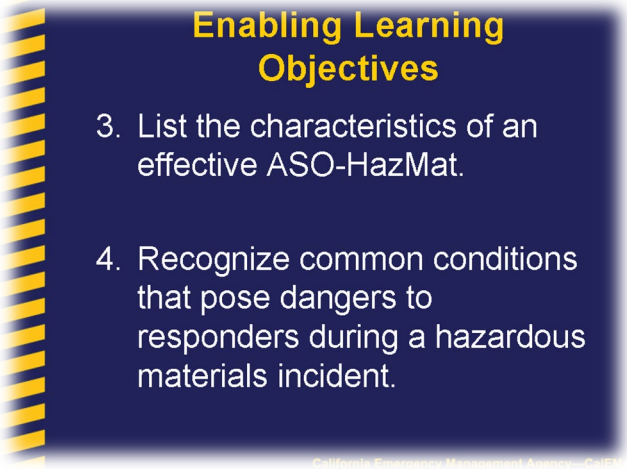


Slide 1.2

The goal (terminal learning objective) of this chapter is to ensure that participants will be able to determine the magnitude of the problem an incident presents in terms of responder safety.

This chapter's enabling learning objectives are to ensure participants will have the capability to:

1. Describe the core competencies of an effective Assistant Safety Officer-Hazardous Materials (ASO-HazMat).
2. Describe the steps for achieving change.

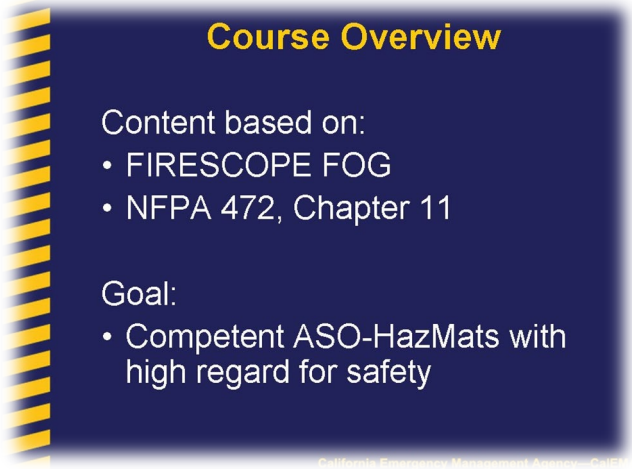


Slide 1.3

The enabling learning objectives in this chapter will also ensure that participants will be able to:

3. List the characteristics of an effective ASO-HazMat.
4. Recognize common conditions that pose dangers to responders during a hazardous materials incident.

California Specialized Training Institute, 2019



Slide 1.4

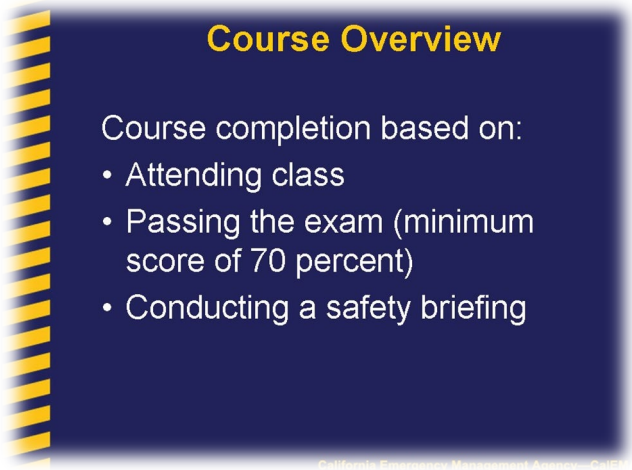
The content for this course is based on:

- FIRESCOPE Field Operations Guide, Assistant Safety Officer-Hazardous Materials (ASO-HazMat)
- National Fire Protection Association Standard 472, Competence of Responders to Hazardous Materials and Weapons of Mass Destruction Incidents, Chapter 11 (2008 edition)

This course will address the role of the ASO-HazMat, laws and regulations pertaining to hazardous materials response, pre-event and event-specific plans, personnel monitoring, guidelines for decontamination, safety messages, and terrorist events.

It will also examine many of the reports, forms, and documents the ASO-HazMat will need to be familiar with and use on a regular basis. Discussions and pen-and-paper activities will help reinforce key concepts.

The goal of this course is to train competent ASO-HazMats who have a high regard for safety.



Slide 1.5

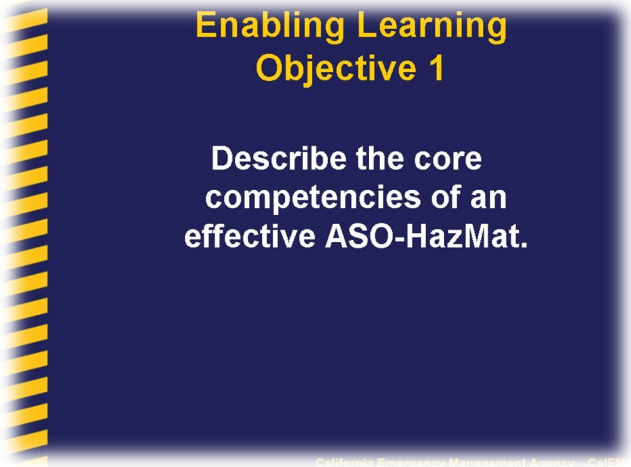
California Specialized Training Institute, 2019



Slide 1.6

CSTI offers a standardized training program that meets OSHA regulations and NFPA Standard 472. Once participants have successfully taken this course, CSTI issues a Certificate of Completion. To qualify as a Type 1 team in California, at least one member needs to be trained at this level.

FIRESCOPE is developing a Position Task Book that will help ensure that people who fill the role of ASO-HazMat on a mutual aid incident are competent for that position.



Slide 1.7



Slide 1.8

To ensure responder safety, the ASO-HazMat must be able to analyze the problem involving hazardous materials, assess the hazards, evaluate the potential consequences, and determine the appropriate response based on the facts, science, and circumstances of the incident.

The ASO-HazMat must also ensure that responders actually follow standard operating procedures and incident specific safety measures.

California Specialized Training Institute, 2019



Slide 1.9

The Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents (NFPA 472) addresses the *minimum* competencies required for those who respond to incidents involving hazardous materials/weapons of mass destruction (hazmat/WMD) and that are necessary for a risk-based response.

In brief, these competencies involve the following tasks:

- Analyze a hazmat/WMD incident to determine the complexity of the problem in terms of safety.
- Assist in planning a safe response within the capabilities of available response personnel, personal protective equipment, and control equipment.
- Ensure the implementation of a safe response consistent with the Incident Action Plan and the emergency response plan and/or standard operating procedures.



Slide 1.10

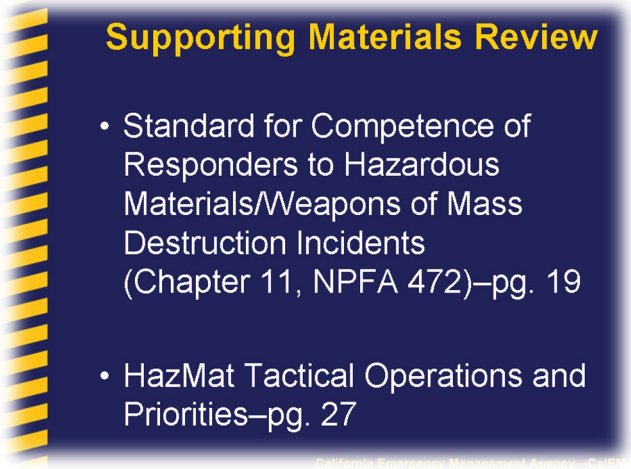
NFPA 472 also states that hazardous materials responders must be able to:

- Evaluate the progress of the planned response to ensure that the response objectives are being met safely.
- Assist in terminating the incident.

Of course, these core competencies involve the acquisition of in-depth knowledge and skills regarding hazmat/WMD response.

Moreover, the position of ASO-HazMat entails many, many more duties and procedures than are identified here. Chapter 2, The Role of the Assistant Safety Officer-Hazardous Materials, will go into detail about the basic duties and procedures an ASO-HazMat must perform. Further chapters will provide specific information on each of the competencies identified in NFPA 472.

California Specialized Training Institute, 2019



Slide 1.11

Review the listed supporting materials in the participant guide, pages 19 and 27.

In terms of health and safety, there is very little difference between hazmat and WMD responses. Hazardous materials are any solid, liquid, gas, or energy that, when released into the environment, can harm people, property, or the environment. Weapons of mass destruction describe the same materials and effects, but in measurable quantities.

The primary difference between these two lies in the events leading up to the release. Was the release accidental or was it done with criminal intent? While the events that lead to a hazmat/WMD incident may vary, the actions responders must take upon arrival typically are the same.

Many of the responsibilities of the ASO-HazMat that are introduced here will be explored in greater depth in later chapters.

The acronyms in HazMat Tactical Operations and Priorities, page 27, are reminders of what is important during a hazmat response.



Slide 1.12

The ASO-HazMat participates in planning the response and developing the site safety plan. The site safety plan provides the blueprint for executing many of the tasks addressed in the basic competencies of hazmat response.

In particular, ICS Form 208 (Site Safety and Control Plan) is one of the most important tools the ASO-HazMat will use in protecting responder safety. This document establishes procedures for the immediate incident scene. ASO-HazMat should become very familiar with—and adept at using—this document.

This slide and the one that follows lists the topics covered by the ICS Form 208. Chapter 5, Incident Planning, will discuss the components of a site safety plan in detail.

California Specialized Training Institute, 2019

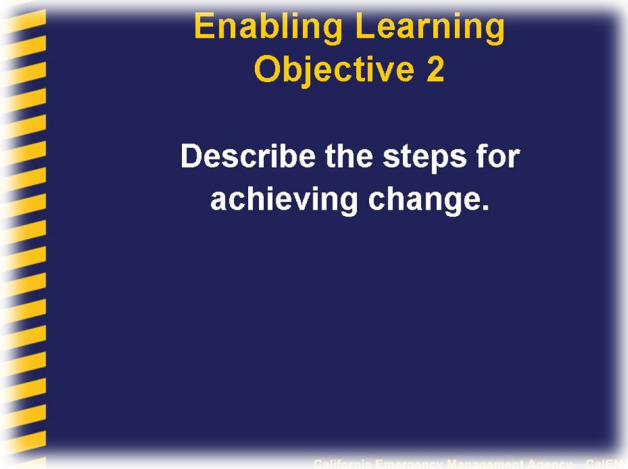


Slide 1.13



Slide 1.14

In this video, a rescue attempt has failed.



Slide 1.15



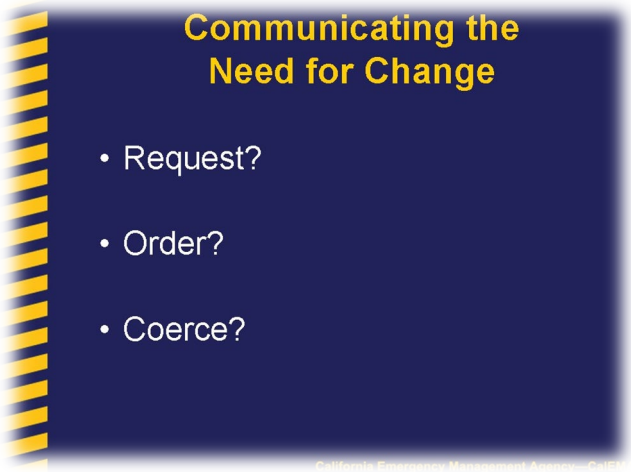
Slide 1.16

In order to protect the safety of responders during a hazardous materials incident, an ASO-HazMat ***must*** be able to clearly communicate critical information to an array of audiences—from the Incident Commander to the Operations Chief to the responders themselves, and to many others as well.

That is why we say a good ASO-HazMat is a good communicator. A good communicator is an effective communicator. Assigning meaning is the central act of communication.

Everything we say and do speaks to people. Sometimes our body language or the things we *don't* say communicates volumes to others. Nonverbal communication can speak louder than words.

So much of what the ASO-HazMat needs to communicate, centers around safety: safety attitudes, safety behaviors, safety habits, safety requirements, etc.

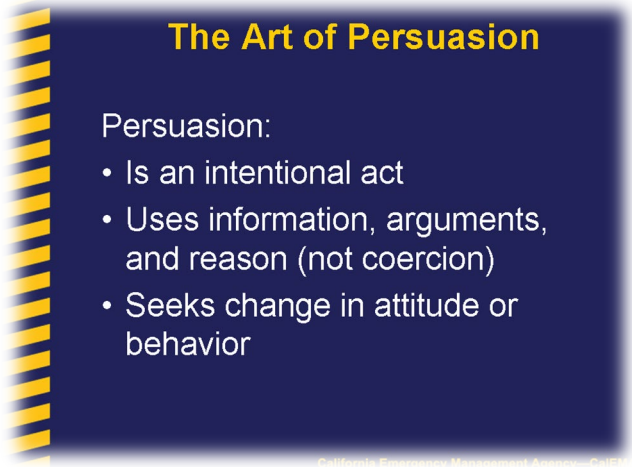


Slide 1.17

In the role of ASO-HazMat, a great deal of communication about safety will be aimed at getting a responder to change the way he or she is doing something.

Communicating that need for change can be acomplished in a number of ways, such as making a request, delivering an order, or using coercion. Depending on the circumstances, each of these approaches may have its place in communicating the need for change.

California Specialized Training Institute, 2019



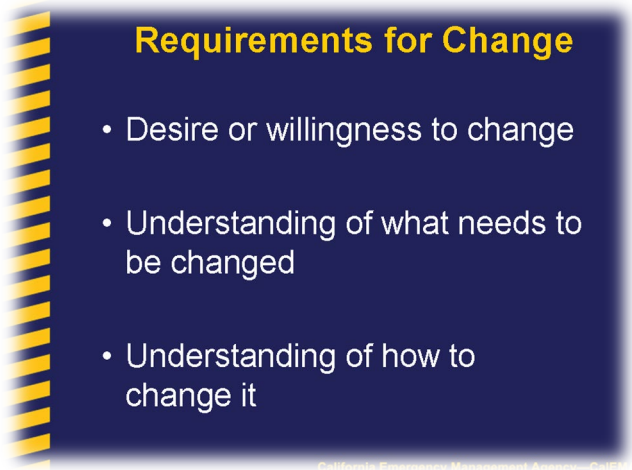
Slide 1.18

In general, persuasion usually is the best approach to communicating the need for change.

Persuasion is an intentional act of communication. It draws on information, arguments, and reason to achieve its ends. And it uses a carrot, rather than a stick.

Persuasion seeks to enhance safety through a change in the attitude or behavior of a responder—or team of responders.

The greater your depth of knowledge on every aspect of being an ASO-HazMat and the greater your ability to communicate procedures and safety measures, etc., the more effective you will be as an ASO-HazMat.



Slide 1.19

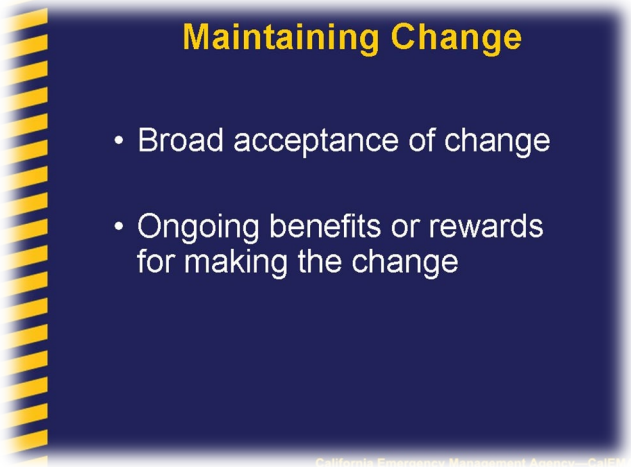
What do people need before they will change their attitudes or their behavior?

First of all, they need to have the desire or the willingness to change. Oftentimes, that desire or willingness is the result of recognizing the rewards or benefits that come with making a specific change. Sometimes, though, the desire or willingness to change is spurred by a more basic impulse: to avoid punishment.

Second, people need to understand *what* needs to be changed and *why* it needs to be changed. When people understand the what and the why of doing something differently, they're more likely to make the change—and they're more likely to make the change a consistent part of their behavior or way of doing things.

Finally, and equally important, they need to know *how* they can change whatever it is that needs to be changed. In other words, they also need the knowledge and skills—the right tools—to make the change.

California Specialized Training Institute, 2019



Slide 1.20

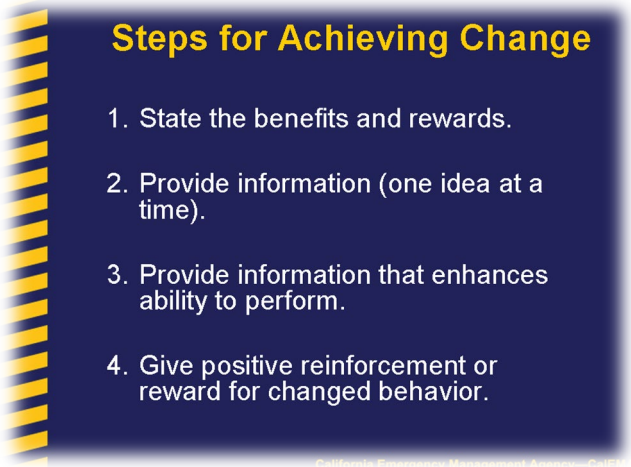
It can take a lot of effort to make a change permanent, rather than temporary. This is especially true if the change requires that a person adopt a new physical or mental role.

It may also take a lot of effort, clear explanation, and instruction on the part of the ASO-HazMat to provide responders with the knowledge and skills they need to be able to perform consistently in that new role.

How can we ensure that change is maintained?

In general, when there's broad acceptance by others for a change, individuals will have an easier time adapting to a change and maintaining it.

When the change is reinforced through positive measures—such as tangible benefits or rewards on an ongoing basis—responders are also more likely to maintain the change.



Slide 1.21

To sum up, these four simple steps will increase the likelihood that you will see the changes that you seek in responder attitude and behavior.

1. State the benefits and rewards.

When people know why they are asked to do something differently and the reasons for the change make sense, the more likely they are to do what you asked of them.

2. Provide information (one idea at a time).

Our brains generally process a relatively small amount of information at any given time. This is especially true when we are under stress. Too much information at once and our brains "shut down."

3. Provide information that enhances an individual's ability to perform.

When communicating, provide the tools (the information) that will help a responder perform more effectively or efficiently. Don't bog the responder down with information he or she does not need.

4. Give positive reinforcement or reward for changed behavior.

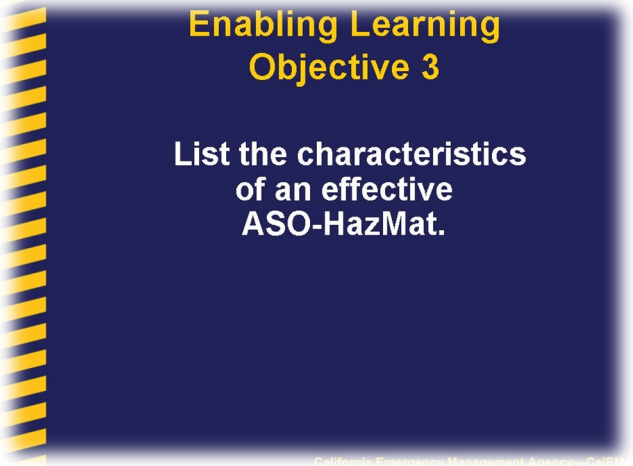
Acknowledgment and praise can go a long way to fostering sustained change. Let team members know they're doing a great job.

California Specialized Training Institute, 2019

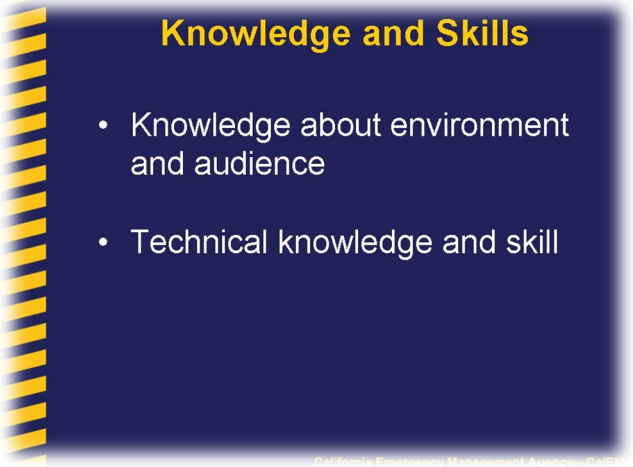


Slide 1.22

In this video, an ASO-HazMat is responding to an incident that involves the release of chlorosulfonic acid on Highway 101 in San Luis Obispo County.



Slide 1.23



Slide 1.24

The previous slides talked about how to bring about and sustain a change in the attitude or behavior of others. The next three slides focus on the kinds of characteristics an ASO-HazMat should have in order to be an effective change agent.

As a change agent, the ASO-HazMat must have a broad base of knowledge and skills. For example, the ASO-HazMat must have training and experience in topics such as firefighting, hazardous materials, emergency medical response, and tactical operations.

California Specialized Training Institute, 2019



Slide 1.25

Having knowledge and skills identified in the previous slide, help establish credibility. But to really effect change, ASO-HazMats must be more than skilled and knowledgeable technicians. They also tend to share common personal characteristics.

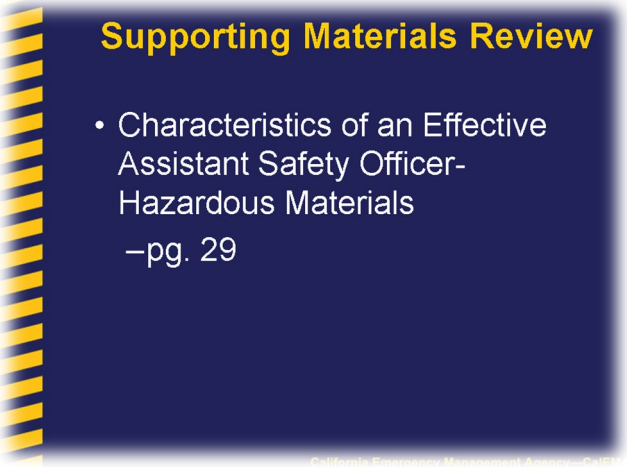
For example, effective ASO-HazMats show empathy, they are flexible, and, as mentioned earlier, they are effective communicators. They also are active listeners.

Effective change agents believe in what they do and are committed to the doing the best they can. In other words, effective change agents are passionate.



Slide 1.26

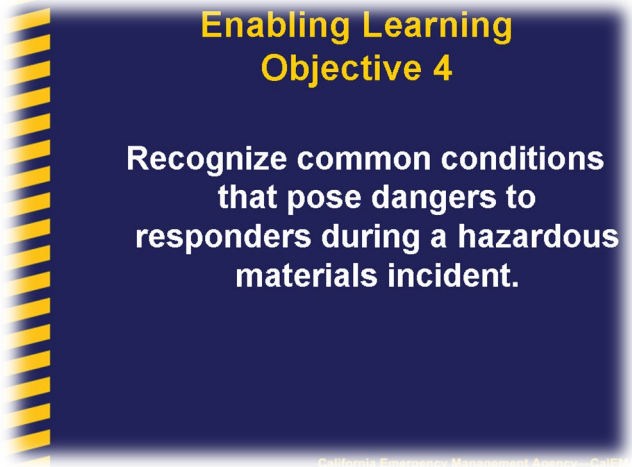
In addition, an effective change agent—the ASO-HazMat—has a genuine concern for responder safety. The effective ASO-HazMat also has the ability to focus on safety issues (not tactics). Moreover, the effective change agent/ASO-HazMat is decisive.



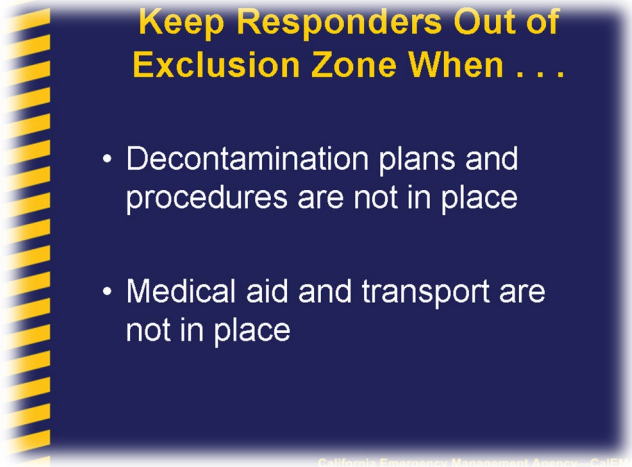
Slide 1.27

Review the listed supporting materials in the participant guide, page 29.

California Specialized Training Institute, 2019



Slide 1.28



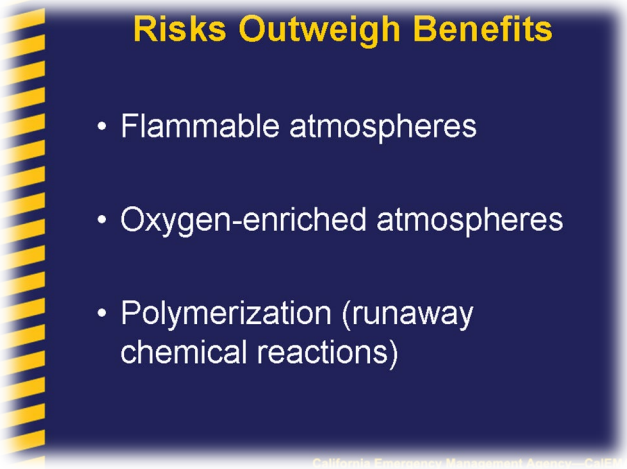
Slide 1.29

Every ASO-HazMat should immediately recognize some basic situations that have the potential for compromising responder safety. Among those situations is the presence of responders in the exclusion zone when neither decontamination plans and procedures nor medical aid and transport have yet been put into place.

The ASO-HazMat should always delay the entry of responders into the hazmat/WMD zone until these conditions—decon and medical aid—have been met.

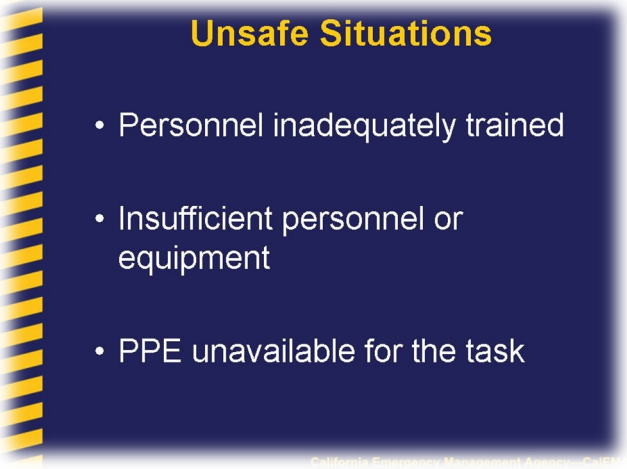
What are other situations in which entry should be delayed? Examples of such situations include not having enough people, inadequate supplies of proper PPE, and when explosions are occurring.

California Specialized Training Institute, 2019



Slide 1.30

Under these conditions, responders are likely to get hurt. The risks to responders far outweigh any benefits. As the ASO-HazMat, you must ensure that responders do not attempt to take action in such situations.



Slide 1.31

Incident plans can be complex and confusing. It is the safety official's task to sift through all of the information and determine if the objectives and tactics can be safely accomplished with the resources that are available. Among the first questions the ASO-HazMat should ask are:

- Are personnel inadequately trained for the incident?
- Are the numbers of personnel and the amount/kind of equipment insufficient for responding safely to the incident?
- Is appropriate personal protective equipment unavailable for the task?

A 'yes' answer to any of these questions should raise a red flag for the ASO-HazMat concerning responder safety.

California Specialized Training Institute, 2019

Slide 1.32



California Specialized Training Institute, 2019

Chapter 1



Supporting Materials/ Resource List

Chapter 11 Competencies for Hazardous Materials Safety Officers

11.1 General

11.1.1 * Introduction.

11.1.1.1 The hazardous materials safety officer (NIMS: Assistant Safety Officer — Hazardous Material) shall be that person who works within an incident management system (IMS) (specifically, the hazardous material branch/group) to ensure that recognized hazardous materials/WMD safe practices are followed at hazardous materials/ WMD incidents.

11.1.1.2 The hazardous materials safety officer shall be trained to meet all competencies at the awareness level (Chapter 4), all core competencies at the operations level (Chapter 5), all competencies at the technician level (Chapter 7), and all competencies of this chapter.

11.1.1.3 The hazardous materials safety officer shall receive additional training to meet applicable governmental occupational health and safety regulations.

11.1.2 Goal.

11.1.2.1 * The goal of the competencies at this level shall be to provide the hazardous materials safety officer with the knowledge and skills to evaluate a hazardous materials/WMD incident for safety and ensure that recognized safe operational practices are followed and to perform the tasks in 11.1.2.2 safely.

11.1.2.2 When responding to hazardous materials/WMD incidents, the hazardous materials safety officer shall be able to perform the following tasks safely and effectively:

(1) Analyze a hazardous materials/WMD incident to determine the complexity of the problem in terms of safety by observing a scene and reviewing and evaluating hazard and response information as it pertains to the safety of all persons in the hazardous materials branch/group.

(2) Assist in planning a safe response within the capabilities of available response personnel, personal protective equipment, and control equipment by completing the following tasks:

(a) Identify the safety precautions for potential response options.

(b) Provide recommendations regarding the site safety and control plan.

(c) Assist in the development of an incident action plan.

(d) Review the incident action plan and provide recommendations regarding safety.

(e) Review the selection of personal protective equipment required for a given action option.

(f) Review the decontamination plan and procedures.

(g) Ensure that emergency medical services are provided.

(3) Ensure the implementation of a safe response consistent with the incident action plan, the emergency response plan, and/or standard operating procedures by completing the following tasks:

(a) Perform the duties of the hazardous materials safety officer within the incident command system.

(b) Identify safety considerations for personnel performing the control functions identified in the site safety and control plan.

(c) Conduct safety briefings for personnel performing the control functions identified in the site safety and control plan.

(d) Assist in the implementation and enforcement of the site safety and control plan.

(e) Maintain communications within the incident command structure during the incident.

(f) Monitor status reports of activities in the hot and the warm zones.

(g) Ensure the implementation of exposure monitoring (personnel and environment).

(4) Evaluate the progress of the planned response to ensure that the response objectives are being met safely by completing the following tasks:

(a) Identify deviations from the site safety and control plan or other dangerous situations.

(b) Alter, suspend, or terminate any activity that can be judged to be unsafe.

(5) Assist in terminating the incident by completing the following tasks:

(a) Perform the reporting, documentation, and follow-up required of the hazardous materials safety officer.

(b) Assist in the debriefing of hazardous materials branch/group personnel.

(c) Assist in the incident critique.

11.2 Competencies — Analyzing the Incident.

11.2.1 Determining the Magnitude of the Problem in Terms of Safety. Given scenarios involving hazardous materials/WMD incidents, the hazardous materials safety officer shall observe a scene, review and evaluate hazard and response information as it pertains to the safety of all persons within the hazardous materials branch/group, and meet the requirements of 11.2.1.1 through 11.2.1.6.

11.2.1.1 The hazardous materials safety officer shall explain the basic toxicological principles relative to the safety of personnel exposed to hazardous materials/WMD, including the following:

(1) Acute and chronic toxicity

(2) Dose response

(3) Local and systemic effects

(4) Routes of exposure to toxic materials

(5) Synergistic effects

11.2.1.2 * The hazardous materials safety officer shall identify at least three conditions where the hazards from flammability would require chemical-protective clothing with thermal protection.

11.2.1.3 * The hazardous materials safety officer shall identify at least three conditions where personnel would not be allowed to enter the hot zone.

11.2.1.4 Given the names of five hazardous materials/WMD and at least three reference sources, the hazardous materials safety officer shall identify the physical and chemical properties and their potential impact on the safety of personnel at an incident involving each of the materials or agents.

11.2.1.5 Given the names of five hazardous materials/WMD and at least three reference sources, the hazardous materials safety officer shall identify the health concerns and their potential impact on the safety and health of personnel at an incident involving each of the materials or agents.

11.2.1.6 * Given the names of five hazardous materials and a description of their containers, the hazardous materials safety officer shall identify five hazards or physical conditions that would affect the safety of personnel at an incident involving each of the materials or agents.

11.3 Competencies — Planning the Response.

11.3.1 * Identifying the Safety Precautions for Potential Response Options. Given scenarios involving hazardous materials/WMD incidents, the hazardous materials safety officer shall assist the hazardous materials officer in developing a site safety and control plan to respond within the capabilities of available response personnel, personal protective equipment, and control equipment and shall complete the following tasks:

(1) *Identify specific safety precautions to be observed during mitigation of each of the hazards or conditions identified in 11.2.1.6.

(2) *Identify safety precautions associated with search and rescue missions at hazardous materials/WMD incidents.

11.3.2 Providing Recommendations Regarding Safety Considerations.

11.3.2.1 Given scenarios involving hazardous materials/WMD incidents, the hazardous materials safety officer shall provide the incident safety officer, hazardous materials officer, and incident commander with observation-based recommendations regarding considerations for the safety of on-site personnel.

11.3.2.2 The hazardous materials safety officer shall develop recommendations for the hazardous materials officer regarding safety considerations of the hazards and risks for each of the hazardous materials/WMD and containers identified in 11.2.1.6.

11.3.3 Assisting in the Development of a Site Safety and Control Plan for Inclusion in the Incident Action Plan. Given scenarios involving hazardous materials/WMD incidents, the hazardous materials safety officer shall assist the incident safety officer and hazardous materials officer in the development of the site safety and control plan for inclusion in the incident action plan and shall complete the following tasks:

(1) *Identify the importance and list five benefits of pre-emergency planning relating to specific sites.

(2) *Identify and name five hazards and precautions to be observed when personnel approach a hazardous materials/WMD incident.

(3) *List the elements of a site safety and control plan.

(4) Given a pre-incident plan and a scenario involving one of the hazardous materials/WMD and containers described in 11.2.1.6, develop safety considerations for the incident.

11.3.4 Providing Recommendations Regarding Safety and Reviewing the Incident Action Plan. Given a proposed incident action plan for an incident involving one of the hazardous materials/WMD and containers described in 11.2.1.6, the hazardous materials safety officer shall identify to the incident safety officer, the hazardous materials officer, and the incident commander the safety precautions for the incident action plan and shall complete the following tasks:

(1) Ensure that the site safety and control plan in the proposed incident action plan is consistent with the emergency response plan and/or standard operating procedures.

(2) Make recommendations to theincident commander on the safety considerations in the proposed incident action plan.

11.3.5 Reviewing Selection of Personal Protective Equipment. Given scenarios involving hazardous materials/WMD incidents, the hazardous materials safety officer shall demonstrate the ability to review the selection of personal protective equipment required for a given action option and shall complete the following tasks:

(1) Identify five safety considerations for personnel working in personal protective equipment.

(2) Given the names of five different hazardous materials/WMD and a chemical compatibility chart for chemical-protective clothing, identify the chemical-protective clothing that would provide protection from the identified hazards to the wearer for each of the five substances.

(3) *Given the names of five different hazardous materials/WMD, identify the personal protective equipment options for specified response options.

(4) Identify the recommended methods for donning, doffing, and using all personal protective equipment provided by the AHJ for use in hazardous materials/WMD response activities.

11.3.6 Reviewing the Proposed Decontamination Procedures. Given site-specific decontamination procedures by the hazardous materials officer or incident commander for a scenario involving a hazardous materials/WMD incident, the hazardous materials safety officer shall review the procedures to ensure that applicable safety considerations are included prior to implementation of the incident action plan.

11.3.7 Ensuring Provision of Emergency Medical Services. Given a scenario involving a hazardous materials/WMD incident, the hazardous materials safety officer shall review the emergency medical services procedures to ensure that response personnel are provided medical care and shall complete the following tasks:

(1) *Identify the elements required in an emergency medical services plan.

(2) Identify the importance of an on-site medical monitoring program.

(3) Identify the resources for the transportation and care of the injured personnel exposed to hazardous materials/WMD.

11.4 Competencies — Implementing the Planned Response.

11.4.1 Performing the Duties of the Hazardous Materials Safety Officer. Given a scenario involving hazardous materials/WMD incidents, the hazardous materials safety officer shall perform the duties of the position in a manner consistent with the emergency response plan and/or standard operating procedures and shall complete the following tasks:

(1) Identify the duties of the hazardous materials safety officer as defined in the emergency response plan and/or standard operating procedures.

(2) Demonstrate performance of the duties of the hazardous materials safety officer as defined in the emergency response plan and/or standard operating procedures.

11.4.2 Monitoring Safety **of Response Personnel.** Given scenarios involving a hazardous materials/WMD incident, the hazardous materials safety officer shall ensure that personnel perform their tasks in a safe manner by identifying the safety considerations for the control functions identified in the site safety and control plan and shall complete the following tasks:

(1) Identify the safe operating practices that are required to be followed at a hazardous materials/WMD incident as stated in the emergency response plan and/or standard operating procedures.

(2) Identify how the following factors influence heat and cold stress for hazardous materials response personnel:

(a) Activity levels

(b) Duration of entry

(c) Environmental factors

(d) Hydration

(e) Level of personal protective equipment

(f) Physical fitness

(3) Identify the methods that minimize the potential harm from heat and cold stresses.

(4) Identify the safety considerations that minimize the psychological and physical stresses on personnel working in personal protective equipment.

(5) Describe five conditions in which it would be prudent to withdraw from a hazardous materials/WMD incident.

11.4.3 Conducting Safety Briefings.

11.4.3.1 Given a scenario involving a hazardous materials/WMD incident and site safety and control plan, the hazardous materials safety officer shall conduct safety briefings for personnel performing the functions identified in the incident action plan.

11.4.3.2 The hazardous materials safety officer shall be able to demonstrate the procedure for conducting a safety briefing to personnel for an incident involving one of the hazardous materials/WMD and its container identified in 11.2.1.6, as specified by the emergency response plan and/or standard operating procedures.

11.4.4 Implementing and Enforcing the Site Safety and Control Plan. Given a scenario involving a hazardous materials/WMD incident and site safety and control plan, the hazardous materials safety officer shall assist the incident commander, the incident safety officer, and the hazardous materials officer in implementing and enforcing the safety considerations and shall complete the following tasks:

(1) Identify whether the boundaries of the established control zones are clearly marked, consistent with the site safety and control plan, and are being maintained.

(2) Identify whether the on-site medical monitoring required by the emergency response plan and/or standard operating procedures is being performed.

(3) Given an entry team, a backup team, and a decontamination team working in personal protective clothing and equipment, verify that each team is protected and prepared to safely perform its assigned tasks by completing the following:

(a) Determine whether the selection of clothing and equipment is consistent with the site safety and control plan.

(b) Determine whether each team has examined the clothing for barrier integrity and the equipment to ensure correct working order.

(c) Determine whether protective clothing and equipment have been donned in accordance with the standard operating procedures and the manufacturer's recommendations.

(4) Determine whether each person entering the hot zone has a specific task assignment, understands the assignment, is trained to perform the assigned task(s), and is working with a designated partner at all times during the assignment.

(5) Determine whether a backup team is prepared at all times for immediate entry into the hot zone during entry team operations.

(6) Determine whether the decontamination procedures specified in the site safety and control plan are in place before any entry into the hot zone.

(7) Verify that each person exiting the hot zone and each tool or piece of equipment is decontaminated in accordance with the site safety and control plan and the degree of hazardous materials/WMD contamination.

(8) Demonstrate the procedure for recording the names of the individuals exiting the hot zone, as specified in the emergency response

plan and/or standard operating procedures.

(9) *Identify three safety considerations that can minimize secondary contamination.

11.4.5 Maintaining Communications. Given a scenario involving a hazardous materials/WMD incident and the site safety and control plan, the hazardous materials safety officer shall maintain routine and emergency communications within the incident command structure at all times during the incident and shall complete the following tasks:

(1) *Identify three types of communications systems used at hazardous materials/WMD incident sites.

(2) Verify that each person assigned to work in the hot zone understands the emergency alerting and response procedures specified in the safety considerations prior to entry into the hot zone.

11.4.6 Monitoring Status Reports.

11.4.6.1 Given a scenario involving a hazardous materials/WMD incidentand the site safety and control plan, the hazardous materials safety officer shall monitor routine and emergency communications within the incident command structure at all times during the incident.

11.4.6.2 The hazardous materials safety officer shall ensure that entry team members regularly communicate the status of their work assignment to the hazardous materials officer.

11.4.7 Implementing Exposure Monitoring. Given a scenario involving a hazardous materials/WMD incident and the site safety and control plan, the hazardous materials safety officer shall assist the incident commander, the incident safety officer, and the hazardous materials officer in implementing exposure monitoring.

11.4.8 Verifying **Exposure** Monitoring. The hazardous materials safety officer shall identify that exposure monitoring (personnel and environment), as specified in the emergency response plan and/or standard operating procedures and site safety and control plan considerations, is performed.

11.5 Competencies — Evaluating Progress.

11.5.1 Identifying Deviations from Safety Considerations or Other Dangerous Situations. Given scenarios involving hazardous materials/WMD incidents and given deviations from the site safety and control plan for activities in both the hot and warm zones and dangerous conditions, the hazardous materials safety officer shall evaluate the progress of the planned response to ensure that the response objectives are being met safely and shall complete the following tasks:

(1) Identify those actions that deviate from the site safety and control plan or that otherwise violate accepted safe operating practices, organizational policies, or applicable occupational safety and health laws, regulations, codes, standards, or guidelines.

(2) Identify dangerous conditions that develop or are identified during work in the hot or warm zones that threaten the safety or health of persons in those zones.

(3) Identify the signs and symptoms of psychological and physical stresses on personnel wearing personal protective equipment.

11.5.2 Taking Corrective Actions. Given scenarios involving hazardous materials/WMD incidents and given deviations from the site safety and control plan for activities in both the hot and warm zones and dangerous conditions, the hazardous materials safety officer shall take such corrective actions as are necessary to ensure the safety and health of persons in the hot and warm zones and shall complete the following tasks:

(1) Send emergency communications to and receive emergency

communications from the incident safety officer, entry team personnel, the hazardous materials officer, and others regarding safe working practices and conditions:

(a) *Given a hazardous situation or condition that has developed or been identified following initial hot zone entry, demonstrate the application of the emergency alerting procedures specified in the site safety and control plan to communicate the hazard and emergency response information to the affected personnel.

(b) Given a demonstrated emergency alert via hand signal by a member of the entry team operating within the hot zone, identify the meaning of that signal as specified in the site safety and control plan.

(2) Identify the procedures to alter, suspend, or terminate any activity that can be judged to be unsafe, as specified in the emergency response plan and/or standard operating procedures.

(3) Demonstrate the procedure for notifying the appropriate individual of the unsafe action and for directing alternative safe actions, in accordance with the site safety and control plan and standard operating procedures.

(4) Demonstrate the procedure for suspending or terminating an action that could result in an imminent hazard condition, in accordance with the emergency response plan and standard operating procedures.

11.6 Competencies — Terminating the Incident.

11.6.1 Reporting and Documenting the Incident. Given scenarios involving hazardous materials/WMD incidents, the hazardous materials safety officer shall complete and submit the reports, documentation, and follow-up required of the hazardous materials safety officer and shall complete the following tasks:

(1) Identify the safety reports and supporting documentation required by the emergency response plan and/or standard operating procedures.

(2) Demonstrate completion of the safety reports required by the emergency response plan and/or standard operating procedures.

(3) Describe the importance of personnel exposure records.

11.6.2 **Debriefing of** Hazardous Materials Branch/Group **Personnel.** Given scenarios involving hazardous materials/WMD incidents, the hazardous materials safety officer shall debrief hazardous materials branch/group personnel regarding site-specific occupational safety and health issues.

11.6.2.1 * The hazardous materials safety officer shall be able to identify five health and safety topics to be addressed in an incident debriefing.

11.6.2.2 The hazardous materials safety officer shall demonstrate the procedure for debriefing hazardous materials branch/group personnel regarding site-specific occupational safety and health areas of concern, as specified in the site safety and control plan, emergency response plan, and standard operating procedures.

11.6.3 Assisting in the Incident Critique. Given scenarios involving hazardous materials/WMD incidents and the site safety and control plan, the hazardous materials safety officer shall provide safety and health-related critical observations of the activities that were performed in the hot and warm zones during the incident.

11.6.3.1 Information to be presented. Given the site safety and control plan and the hazardous materials safety officer's report for a scenario involving a hazardous materials/WMD incident, the hazardous materials safety officer shall demonstrate the procedure for verbally presenting the following information in

accordance with the emergency response plan and/or standard operating procedures:

(1) Safety and health-related critical observations of the activities that were performed in the hot and warm zones during the incident.

(2) Recorded violations of the site safety and control plan or generally accepted safe operating practices, organizational policies, or applicable occupational safety and health laws, regulations, codes, standards, or guidelines.

(3) Injuries or deaths that occurred *as* a result of reasonably unforeseen dangerous conditions that developed during the incident.

(4) Injuries or deaths that occurred as a result of violations of the site safety and control plan, generally accepted safe operating practices, organizational policies, or applicable occupational safety and health laws, regulations, codes, standards, or guidelines.

(5) The course of action (s) that likely would have prevented the injuries or deaths that occurred as a result of the safety violations identified in 11.6.3.1(4).

(6) Deficiencies or weaknesses in the site safety and control plan, emergency response plan, and standard operating procedures that were noted during or following the incident.

Reproduced with permission from NFPA 472, *Competence of Responders to Hazardous Materials of Mass Destruction Incidents,* Copyright©2008, National Fire Protection Association. This reprinted material is not the complete and official position of NFPA on the referenced subject, which is represented only by the standard in its entirety.

HazMat Tactical Operations and Priorities

These easy-to-remember acronyms will help you focus on what is important during a hazmat response.

SIn

Safety
Isolation and Deny Entry
notifications

CIA

Command/Management
Identification and Hazard Assessment
Action Planning

PCP

Protective Equipment
Containment and Control
Protective Actions

ddd

decontamination and Cleanup
disposal
documentation

California Specialized Training Institute, 2019

Characteristics of an Effective Assistant Safety Officer-Hazardous Materials

As with most jobs, the position of Assistant Safety Officer-Hazardous Materials (ASO-HazMat) calls for certain personal characteristics to be successful. Although a range of personal attributes, such as positive attitude and level-headedness, are important to be effective the ASO-HazMat should possess four essential characteristics. Those characteristics are good communication skills, genuine concern for responder safety, the ability to focus, and quick decision making.

Good Communication Skills

The ability to communicate effectively will influence every interaction the ASO-HazMat has with responders and supervisors. The ASO-HazMat must be able to convey messages in a clear and concise manner. The instructions an ASO-HazMat conveys may play a critical part in protecting responder safety. The ASO-HazMat must also be an active listener and accurately interpret what others are saying, understanding how the information relates to incident safety.

Genuine Concern for Safety

A bedrock characteristic of the effective ASO-HazMat is genuine concern for the safety of responders. The role of an ASO-HazMat is that of protector, rather than enforcer. Although the Safety Officer or ASO-HazMat must enforce certain practices and procedures, he or she is doing so to ensure responder safety, not to act as the incident bully.

Ability to Focus

The ASO-HazMat must be able to focus exclusively on his or her area of responsibility; that is, safety. In the flurry of activity at an incident, it can be easy for ASO-HazMat to be distracted from safety concerns and drawn into tactical operations. However, safety is critical, and the ASO-HazMat must concentrate solely on this responsibility and leave tactical operations to others.

Ability to Make Quick decisions

The ASO-HazMat also must be able to make quick decisions during times of high stress. Being decisive and confident are characteristics that will help keep responders out of harm's way. In order to make decisions quickly and ensure the safety of responders, an ASO-HazMat must highly trained and knowledgeable. Thorough knowledge of Standard Operating Procedures and Standard Operating Guidelines combined with training on tactical operations are essential. Equipped with this knowledge and training, the ASO-HazMat should be able to recognize when situations, practices, and procedures promote responder safety, and when those factors put responders at risk for injury, illness, or death.

California Specialized Training Institute, 2019

The role of the Assistant Safety Officer-Hazardous Materials



Scope

This chapter discusses the role and importance of an Assistant Safety Officer-Hazardous Materials (ASO-HazMat) and describes some of the tools and procedures an ASO-HazMat must be familiar with to carry out the responsibilities of this position.



Terminal Learning Objective (TLO)

At the end of instruction for Chapter 2, participants will be able to develop measures that ensure the safety of personnel at a hazardous materials incident.



Enabling Learning Objectives (ELOs)

This chapter's enabling learning objectives are to ensure participants will be able to:

1. Describe the role and responsibilities of an Assistant Safety Officer-Hazardous Materials.
2. Explain what the safety attitude is and why it is important.
3. Assess what might go wrong.
4. Analyze personnel management strategies.

Supporting Materials/resource List

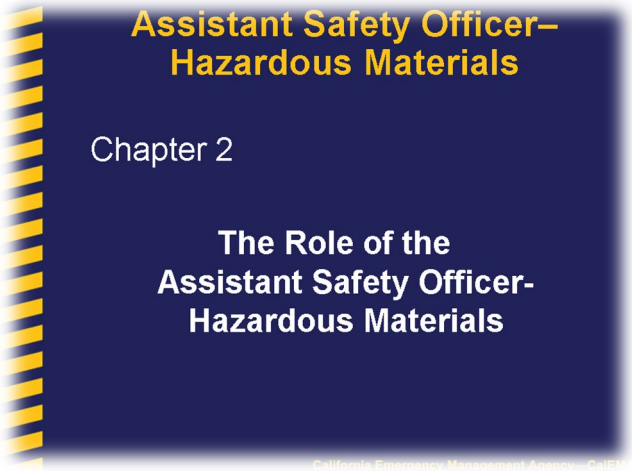
See Supporting Materials/Resource List section starting on page 49.



Practical Exercises

See Practical Exercises section starting on page 87.

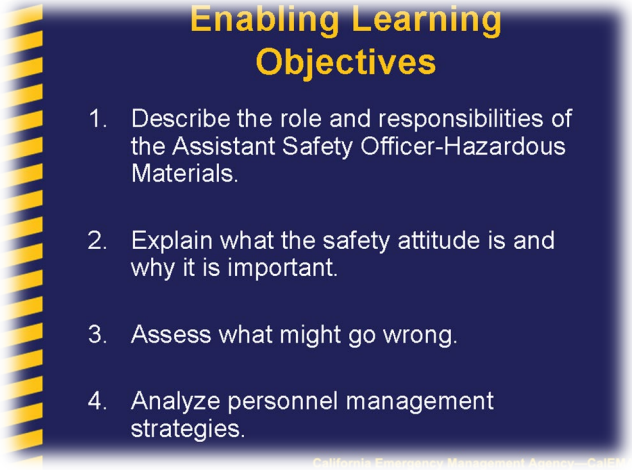
California Specialized Training Institute, 2019



Slide 2.1

The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

- (Res.A.2 1.4.1) Coordinate with Emergency Operations Center/responders for situational awareness and public safety concerns.
- (Res.B.2 5.4) Ensure the safety of all on-scene responders.
- (Res.B.2 5.1.1.5) Assess hazardous materials release situation.

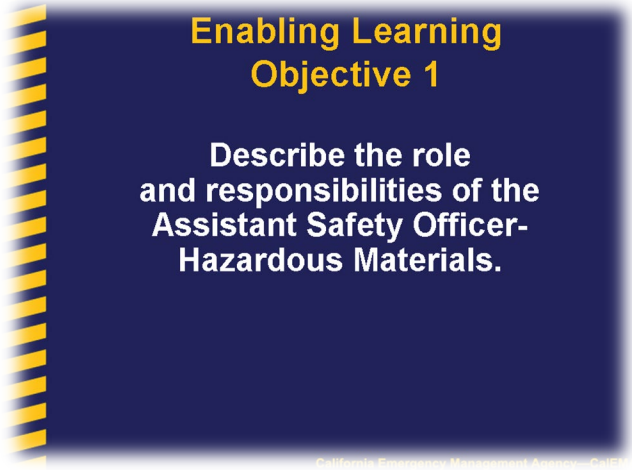


Slide 2.2

The goal (terminal learning objective) of this chapter is to ensure that participants will be able to develop measures that ensure the safety of personnel at a hazardous materials incident.

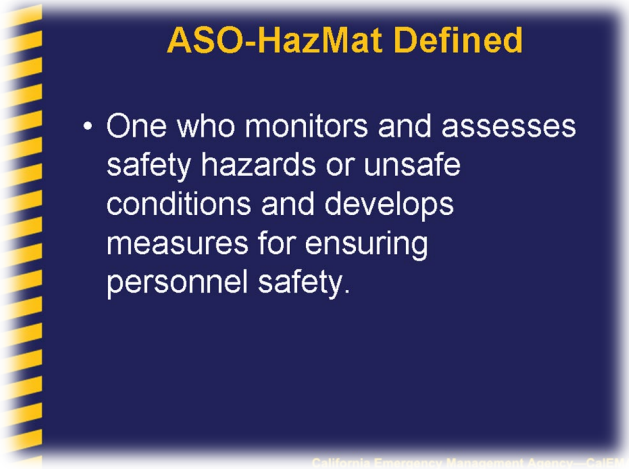
This chapter's enabling learning objectives are to ensure participants will be able to:

1. Describe the role and responsibilities of an ASO-HazMat.
2. Explain what the safety attitude is and why it is important.
3. Assess what might go wrong.
4. Analyze personnel management strategies.



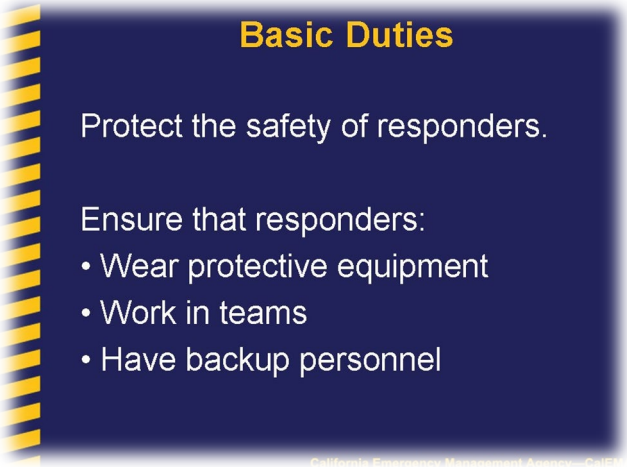
Slide 2.3

California Specialized Training Institute, 2019



Slide 2.4

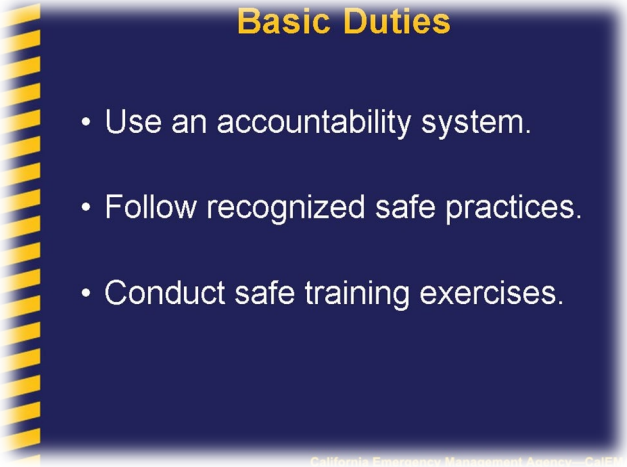
Ensuring the safety of all personnel at a hazardous materials incident is the primary function of the Assistant Safety Officer-Hazardous Materials, or ASO-HazMat.



Slide 2.5

These are some of the basic duties the Safety Officer or ASO-HazMat fulfills to ensure that workers are protected.

Every ASO-HazMat should be sure that these measures are carried out within their respective agencies.



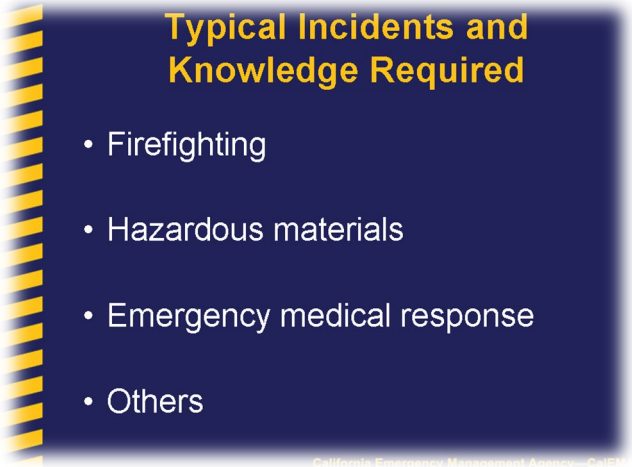
Slide 2.6

Use an accountability system to track on-the-scene personnel.

Ensure the availability of back-up teams, rapid intervention crews, and other safe practices.

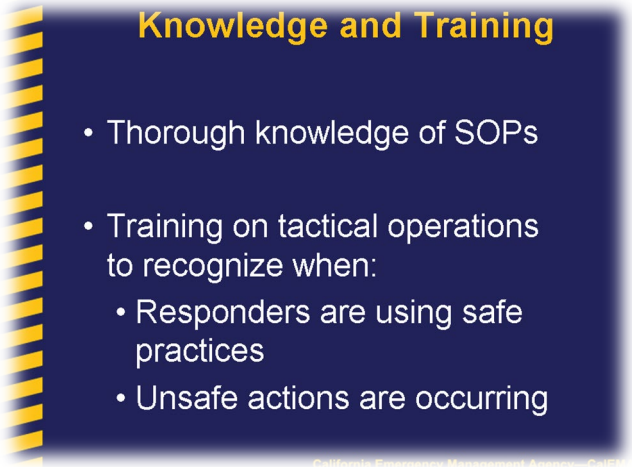
Incorporate these practices into training exercises to help ensure they will be conducted during an emergency response.

California Specialized Training Institute, 2019



Slide 2.7

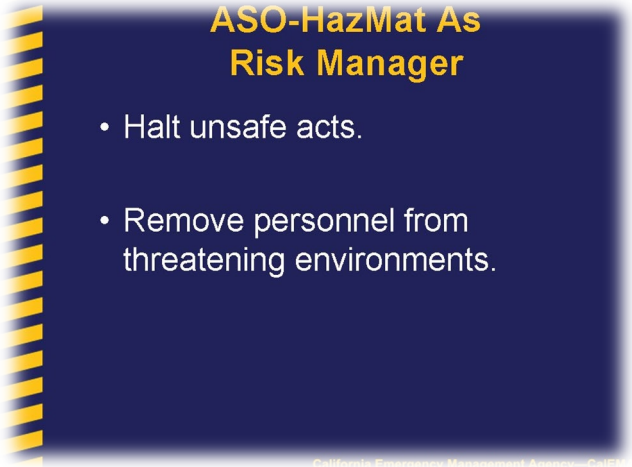
Because many events can include more than one type of emergency, the ASO-HazMat should have a broad knowledge base. During a hazmat event, for example, there may be fire and/or a medical emergency.



Slide 2.8

Being decisive—and making decisions quickly—often rests on having thorough knowledge, training, and experience. An effective ASO-HazMat will be confident in his or her knowledge of standard operating procedures.

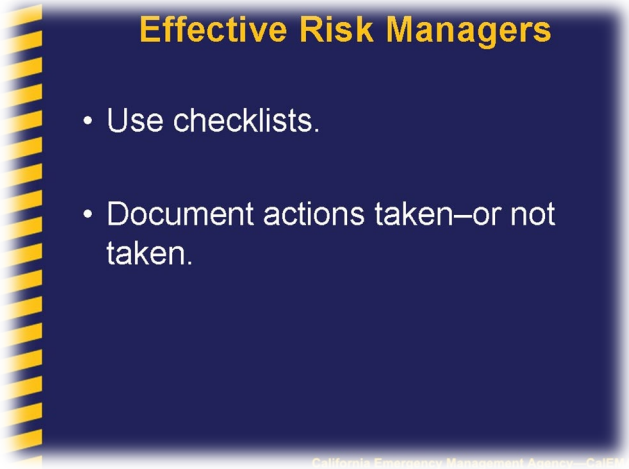
It is also essential for the ASO-HazMat to have extensive training in tactical operations. Familiarity with the operations being conducted gives the ASO-HazMat an opportunity to anticipate unsafe actions and to alter or stop operations, if necessary.



Slide 2.9

The ASO-HazMat is the hazmat risk manager and has the authority to protect personnel. The specifics of the job of ASO-HazMat will be discussed throughout this course. Chapter 4 will go into detail about the role of the ASO-HazMat as a risk manager.

California Specialized Training Institute, 2019



Slide 2.10

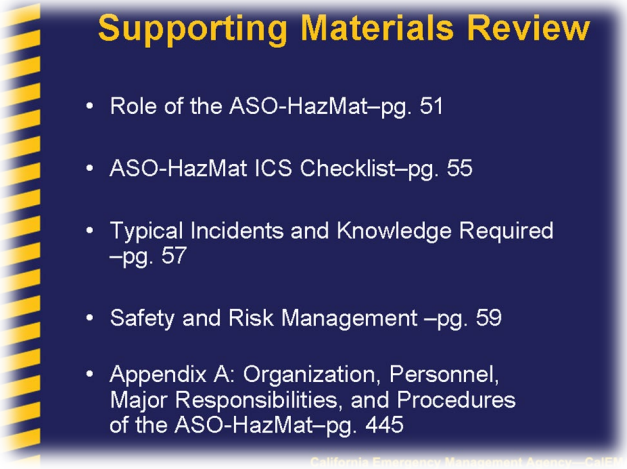
The effective ASO-HazMat, as risk manager, will develop a plan for monitoring the conditions of an incident and for following the actions that will be taken. Checklists can be very helpful for this purpose. Appendix A in the Participant Guide contains a checklist that will assist in this function.

Documentation is an important function of the ASO-HazMat position. Use forms and other documents to chronicle what actions took place—or were supposed to take place but did not.

Be familiar with the documentation requirements of your agency and other response agencies before the incident.



Slide 2.11



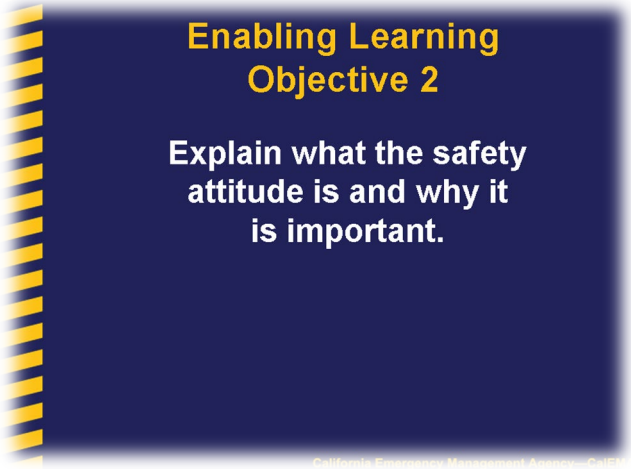
Slide 2.12

Review the listed supporting materials in the participant guide, pages 51, 55, 57, 59, and 445.

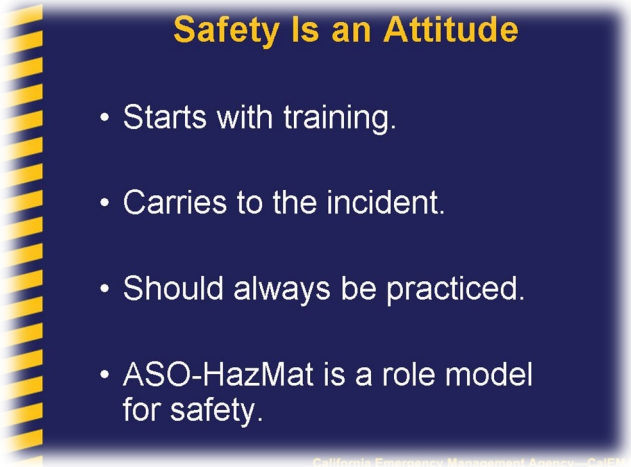
The ASO-HazMat checklist, is a particularly useful tool. Note the importance of checkpoint E:

- Has full authority to alter, suspend or terminate any activity that may be judged to be unsafe in an IDLH condition and/or involves an imminent danger.

California Specialized Training Institute, 2019

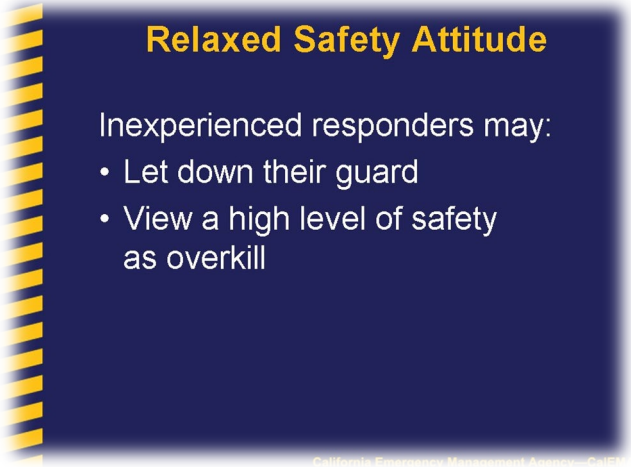


Slide 2.13



Slide 2.14

Safety is not just a set of practices and procedures employed for an emergency response. Safety is an attitude. Safety is an attitude that translates into safe habits. It is an attitude that should be established during training exercises, carried over to the incident scene, and should be practiced at all times.



Slide 2.15

This is a dangerous job. Inexperienced responders who do not perceive an imminent risk may let down their guard and/or view high levels of safety precautions as overkill.

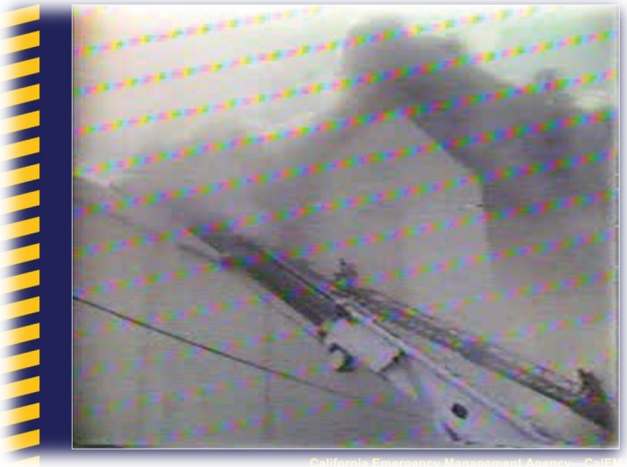
Consider any close calls you may have had in which serious injury or death could have occurred.

California Specialized Training Institute, 2019



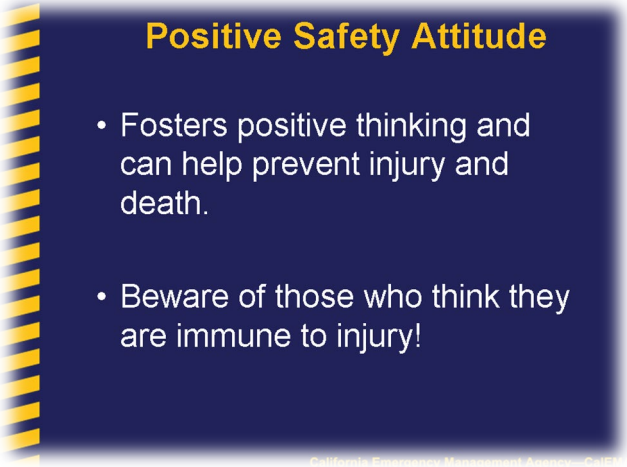
Slide 2.16

A negative attitude toward safety can cause negative thinking and lead to accidents that result in injury, disability, or death.



Slide 2.17

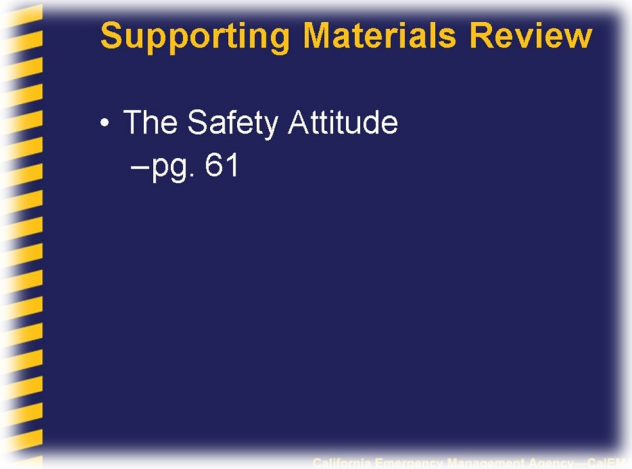
In this video, an experienced responder is not wearing the type of PPE that would be appropriate for the dangers expected in this incident.



Slide 2.18

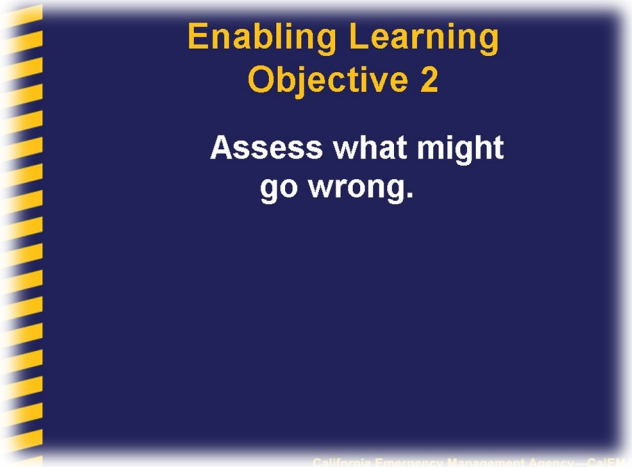
A positive attitude toward safety fosters positive thinking and improves efficiency and effectiveness, thus helping to ensure the health and safety of all responders.

No one is immune to injury.

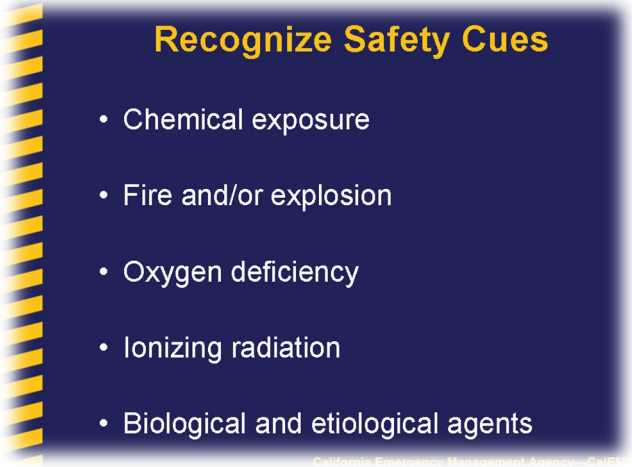


Slide 2.19

Review the listed supporting materials in the participant guide, page 61.



Slide 2.20



Slide 2.21

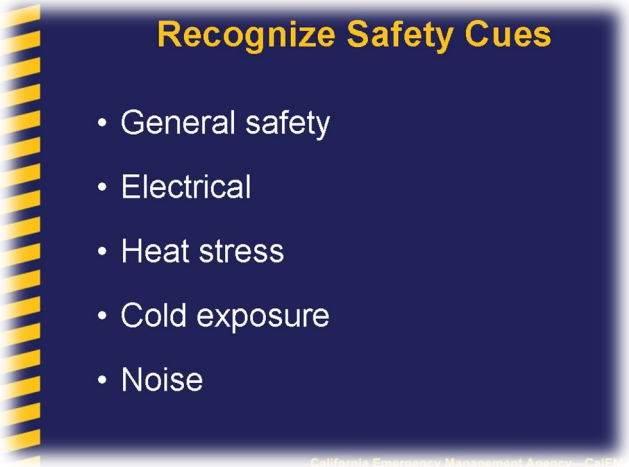
These are some of the dangers that can cause injury, illness, or death to responders during an incident.

California Specialized Training Institute, 2019



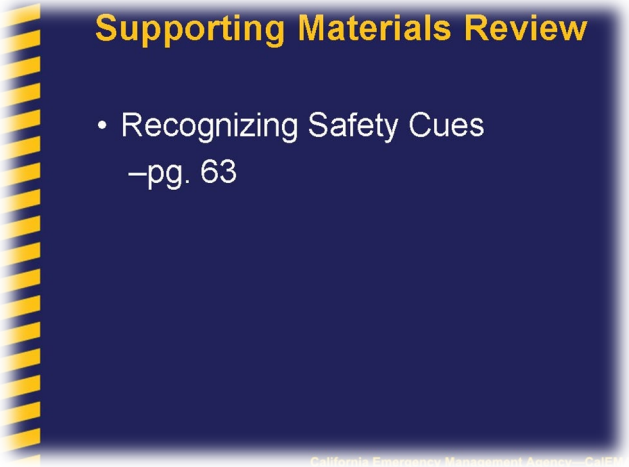
Slide 2.22

In this video, a drum that is half full of water and filled to 50 psi explodes. Pressure in many types of packaging can pose a danger to responders.



Slide 2.23

What are some of the safety issues in each category?

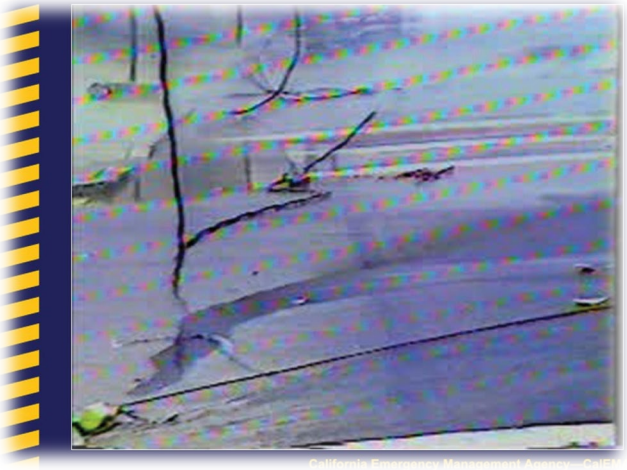


Slide 2.24

Review the listed supporting materials in the participant guide, page 63.

California Specialized Training Institute, 2019

Slide 2.25

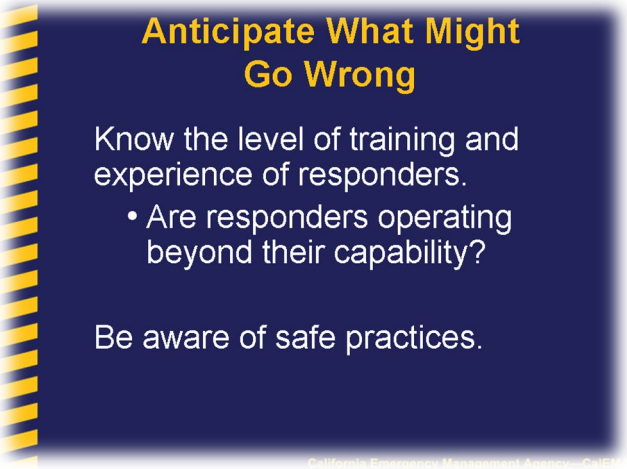


In this video on electrical hazards, responders in different types of PPE encounter several hazards during a rescue. Responders also show different levels of awareness toward the hazards they encounter.

Slide 2.26

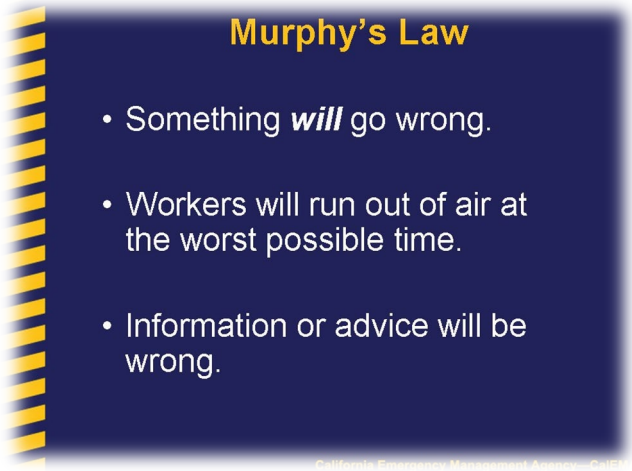


Slide 2.27



Knowing the team and the level of experience that team members have can be difficult in a regional configuration. Whenever possible, engage in trainings with other agencies and jurisdictions that will be activated in a response to a regional event.

California Specialized Training Institute, 2019

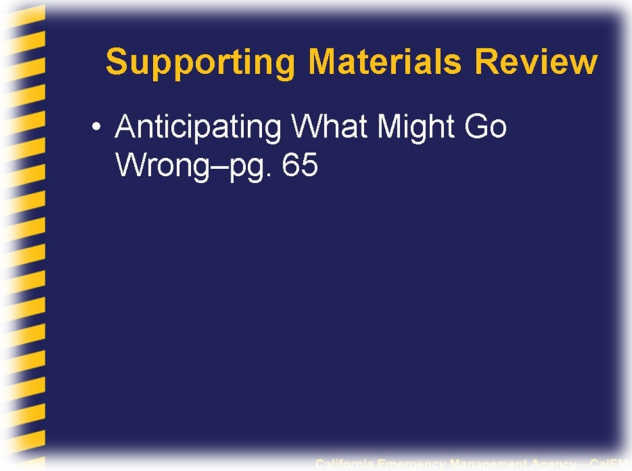


Slide 2.28

Anticipate what could go wrong and expect that *something* will not go as planned. Moreover, plan for the worst.



Slide 2.29



Slide 2.30

Review the listed supporting materials in the participant guide, page 65.

California Specialized Training Institute, 2019



Slide 2.31

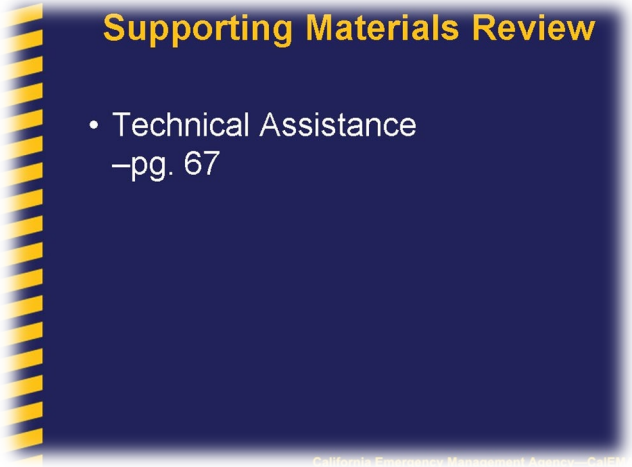
In this video, the press has arrived before a proper command system has been put into place and no Public Information Officer has been assigned to the incident. Members of the press are in the hot zone.



Slide 2.32

The ASO-HazMat should have a thorough knowledge base. However, no individual can be knowledgeable about *every* danger that is inherent to all types of emergencies. As a result, it is important for the ASO-HazMat to know his or her limitations.

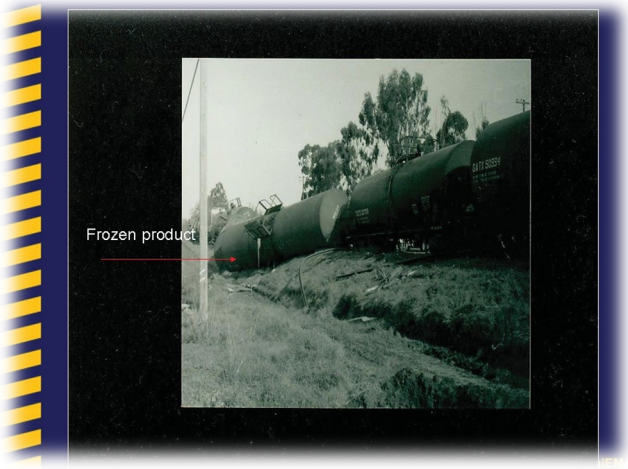
It is equally important for the ASO-HazMat to ask for assistance when unsure about the operations being conducted. This assistance may be in the form of technical experts or, simply, assistants to help handle all of the responsibilities of a large-scale incident.



Slide 2.33

Review the listed supporting materials in the participant guide, page 67.

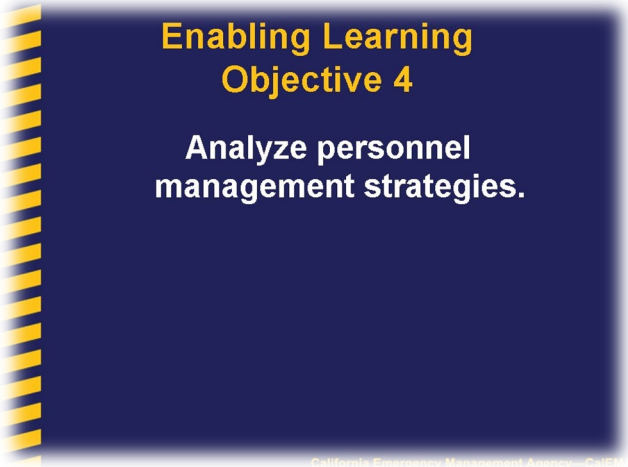
California Specialized Training Institute, 2019



Slide 2.34

In this video, a train has derailed in Willet, California.

Note that the product coming from the manhole is frozen at this temperature (nighttime and early morning). During midday the product would liquefy.



Slide 2.35



Slide 2.36

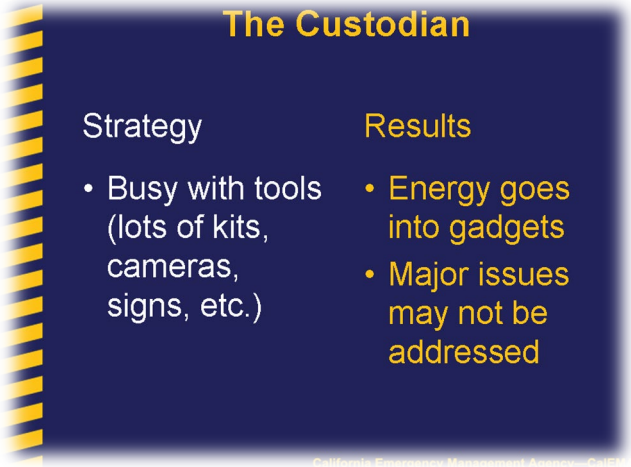
The "enforcer" strategy may not be best for getting a team commitment for safety. This style can turn people off. When staff shut out the ASO-HazMat, safety may be compromised.

California Specialized Training Institute, 2019



Slide 2.37

The "ostrich" strategy gets little or nothing done. The ASO-HazMat position is a dynamic job. Effort is required.



Slide 2.38

Gadgets rule the day, not safety, in the "custodian" strategy. The temptation to get wrapped up in gadgets will only worsen as we increasingly incorporate and rely on electronic tools and technology.



Slide 2.39

The "nice guy" approach to management has varied results. However, safety must be consistent.

The ASO-HazMat will sometimes need to be firm. In seeking to change the behavior of someone on staff, the ASO-HazMat may at times choose to use rewards; at other times, the ASO-HazMat may need to use punishment.

California Specialized Training Institute, 2019



Slide 2.40

The best management strategy is the "team member" approach. This approach results in high team commitment and the best long-term accomplishments, and fosters a safety attitude.



Slide 2.41

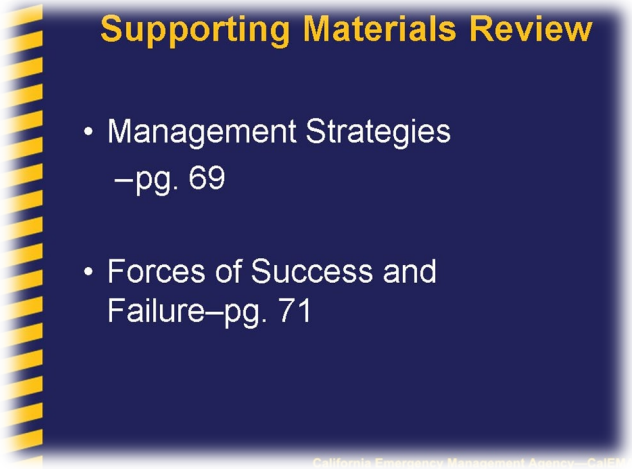
Some forces promote a safety attitude. These forces drive one to succeed.



Slide 2.42

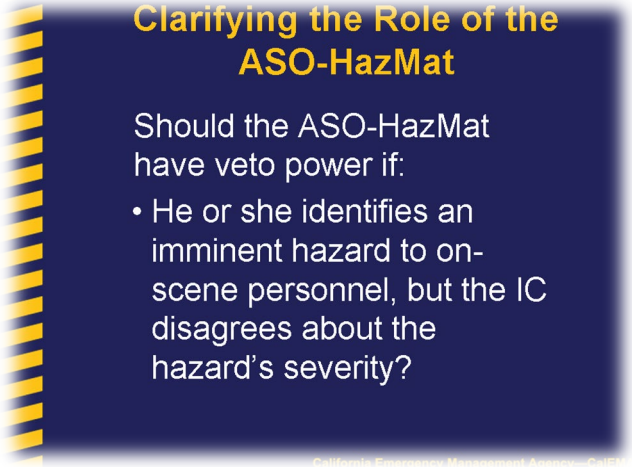
Some forces hinder developing a safety attitude. What other forces interfere with developing a safety attitude? Is there anyone in your organization who might be a resisting force for safety?

California Specialized Training Institute, 2019



Slide 2.43

Review the listed supporting materials in the participant guide, pages 69 and 71.

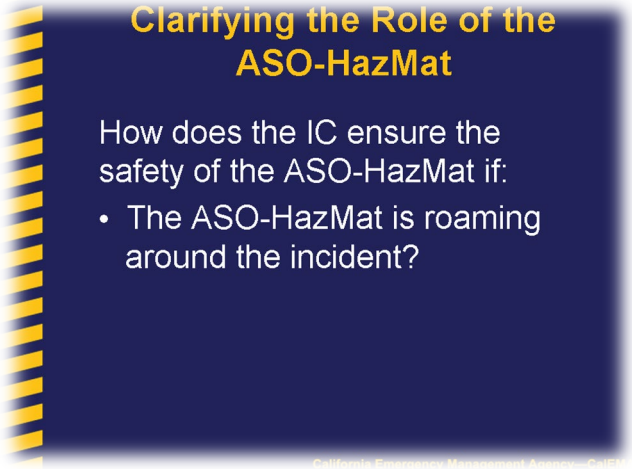


Slide 2.44

When the ASO-HazMat identifies an imminent hazard to on-scene personnel, but the Incident Commander disagrees about the hazard's severity. The Incident Commander has ultimate responsibility for all activities. This situation may result in the selection of a new ASO-HazMat.

In cases of disagreement, the ASO-HazMat may wish to carefully document the specifics of the hazard's assessed severity and the points on which he or she disagreed with the Incident Commander.

The Unit Log or a narrative report is an appropriate tool for this purpose.



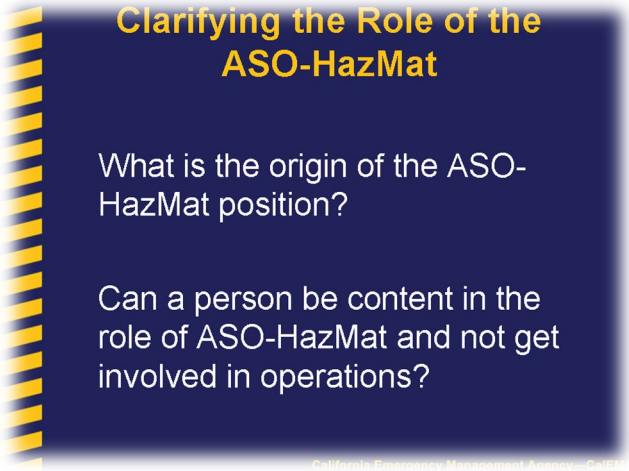
Slide 2.45

It's important for the Incident Commander to ensure the safety of the Safety Officer or the ASO-HazMat if that person is roaming around the incident (for example, the ASO-HazMat dons CPC/PPE and enters a hazard area or zone).

There may be occasion for sending a safety assistant to observe an entry team's operations.

Also, more than one ASO-HazMat can be on an incident. This can usually be handled by an additional entry person whose task is to watch for safety problems.

California Specialized Training Institute, 2019

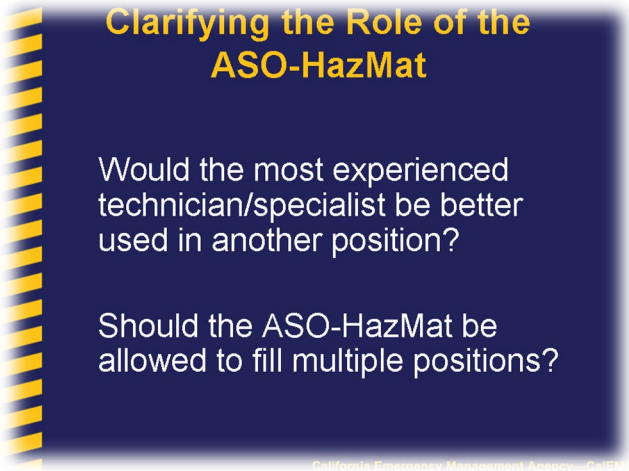


Slide 2.46

The origin of the ASO-HazMat position is FIRESCOPE ICS.

Under FIRESCOPE, the Safety Officer involved in hazardous materials response must have knowledge of and training in the operations that will need to be performed related to hazardous materials. This specialized position is called the Assistant Safety Officer-Hazardous Materials.

Consider whether a person can be content in the role of ASO-HazMat and not get involved in operations.



Slide 2.47

The decision to use the most experienced technician/specialist in another position is incident specific.

Because safety is the main concern, the ASO-HazMat should not be allowed to fill multiple positions. The hazmat team is exposed to numerous dangers during operations. The ASO-HazMat should keep his or her eyes and ears open to help prevent the typical hazards that are always present during hazmat operations (e.g., trip hazards, dangers of wearing chemical protective clothing, etc.).



Slide 2.48

California Specialized Training Institute, 2019

Chapter 2



Supporting Materials/ resource List

role of the Assistant Safety Officer-Hazardous Materials

By the very nature of their jobs, emergency responders are at risk for injury, illness, or death. As a result, safety must be a primary concern for all whose official capacity is to respond to, or to coordinate a response to, an incident. To help reduce the risk to responders, the Incident Command System (ICS) assigns a specific position that is responsible for overseeing all safety aspects of an incident, anticipating hazardous and unsafe situations, and recommending measures for ensuring the safety of all responders. This position is the Incident Safety Officer, also referred to simply as the Safety Officer or SO.

While the Incident Commander (IC) has the overall responsibility for the safety of responders, he or she also has the authority to appoint an SO. An SO may not be needed at every incident. However, it is highly recommended that an IC appoint an SO for all incidents in which the potential for multiple injuries to or death of a responder is high. Moreover, federal and state laws require that the IC appoint an SO for any incident involving hazardous materials. This SO must have knowledge of and training in the operations that will need to be performed related to hazardous materials. In FIRESCOPE ICS, this position is called the Assistant Safety Officer-Hazardous Materials (ASO-HazMat).

A Safety Officer is defined as "one who monitors and assesses safety hazards or unsafe conditions and develops measures for ensuring personnel safety." The SO or ASO-HazMat has the authority to alter, suspend, or terminate unsafe acts or hazardous activities. This makes the safety function unique within the ICS organization. While typically following the chain of command, the SO or ASO-HazMat may bypass the system to correct unsafe actions or remove responders from the threat of danger. In that event, the SO or ASO-HazMat must inform his or her immediate supervisor and the IC as to *what* action was taken and *why* that action was taken.

The SO or ASO-HazMat must also identify existing or potential hazards that do not present an imminent threat to responder safety. Once identified, the SO or ASO-HazMat should communicate these hazards to the IC. Prompt and clear communication will help the IC ensure that the Action Plan (or, in the case of hazardous materials incidents, the Site Safety Plan) addresses the specific hazards. Such communication will also help the IC anticipate any modifications that may be needed to the plan.

Basic duties and Procedures

The major responsibility of an ASO-HazMat is to ensure responder safety. The *Incident Command System Position Manual: Assistant Safety Officer-Hazardous Materials* provides guidelines for duties and procedures that will help the ASO-HazMat carry out this responsibility effectively and efficiently. This section summarizes those guidelines.

Keep in mind that only the basic duties and procedures are summarized here. In addition, some of the activities included here are one-time actions, while others are ongoing or must be repeated throughout the incident.

California Specialized Training Institute, 2019

Review Common Responsibilities

Before addressing the basic duties and procedures that are specific to the position of Assistant Safety Officer-Hazardous Materials, here's a brief review of steps that *all* ICS personnel should take in responding to an incident.

- Receive and review essential information before leaving the agency to go on assignment. This information includes:
  - Job assignment
  - Designation or overhead position
  - Resource order and request number
  - Reporting location and time
  - Travel instructions (route, radio frequency, etc.)
- Check in at a designated location upon arriving at the incident. Check-in locations typically are found at:
  - Incident command post
  - Base or camps
  - Staging areas
- Receive briefing from an immediate supervisor on current activities and expected objectives.
- Acquire all necessary work materials.
- Conduct all tasks in a manner that ensures the safety and welfare of oneself and colleagues.
- Organize and brief subordinates.
- Use clear text and ICS terminology (no codes) in all communications.
- Complete the forms and reports required of the assigned positions and send them through the supervisor to the Documentation Unit.
- Respond to demobilization orders and brief subordinates regarding demobilization.

The ASO-HazMat's Basic Duties and Procedures

Check In

- Check in with the Incident Safety Officer and complete the check-in list (ICS Form 211). If no Safety Officer is available, check in with the Incident Commander.
- Receive a briefing from the Incident Safety Officer or Incident Commander. This briefing should include initial instructions concerning work activities.
- Request a copy of the Incident Action Plan (ICS Form 202), when available. The Action Plan provides written objectives and organizational information about the incident.

California Specialized Training Institute, 2019

- Begin filling out the Unit Log (ICS Form 214). Use the Unit Log to record significant events or action taken during a shift. Submit the Unit Log through the Incident Safety Officer to the Documentation Unit at the end of each operational period.

Receive HazMat Briefing

- Receive a briefing that includes information on the operational objectives from the Hazardous Materials Group Supervisor.
- Obtain the names of essential contact personnel, including how to reach them, their physical locations, and any other pertinent information.

Participate in Planning

- Participate in developing and implementing a written Site Safety Plan. To reduce the likelihood of error, FIRESCOPE recommends working with a member of the Operations Section, Hazardous Materials Group, or other to prepare the Site Safety Plan.
- Conduct a survey of the site and review any documents related to the incident, such as maps, aerial photographs, plant diagrams, and product information.
- Examine evacuation plans for the incident base, command post, and hazard site.
- Review the Medical Plan (ICS Form 206), which is prepared by the Medical Unit Leader and approved by the Incident Safety Officer. This plan should include procedures for handling injuries to responders, transportation capabilities, and the location of treatment areas and hospitals.
- Appraise current weather data and future weather forecasts. Consult local resources, such as television and radio, local airports, and agency dispatch centers, or personal weather observations. Use personal observations.
- Approve the Site Safety Plan.

Advise the HazMat Group Supervisor

- Conduct frequent, continuous visual inspections of the incident to ensure compliance with the Site Safety Plan.
- Advise the Hazardous Materials Group Supervisor (or Hazardous Materials Branch Director) of any deviations from the Site Safety Plan or dangerous situations.
- Maintain communication with the Hazardous Materials Group Supervisor and the Entry Leader. Brief them on foreseeable problems and possible mitigation measures as work progresses.
- Monitor radio traffic within the Hazardous Materials Group.

Alter, Suspend, or Terminate Unsafe Activity

- Alter, suspend, or terminate any unsafe or dangerous activity.
- Notify the Incident Safety Officer of the altered, suspended, or terminated activity.
- Notify the Hazardous Materials Group Supervisor.

California Specialized Training Institute, 2019

- Document the changes, as soon as possible, in the Unit/Activity Log (ICS 214). Diagram and/or photograph the condition and get the names of any witnesses, where possible.
- Keep in mind that altering, suspending, or terminating activities may affect other activities. Contact the supervisor directly responsible for the operation that is to be modified and let him or her to make the necessary change, if at all possible. This will allow the supervisor to provide information about unanticipated consequences and keep him or her in the chain of command.

Protect Personnel

- Ensure that members of the Hazardous Materials Group are protected from physical, environmental, and chemical hazards and exposures.
- Review and approve recommendations for personal protective equipment (PPE).
- Review and approve the operational procedures developed in the Site Safety Plan for the known hazardous materials.
- Wear full PPE.
- Work in teams in hazardous areas.
- Have backup personnel available to react to an unexpected event quickly.
- Use an accountability system to track personnel.
- Follow departmental and recognized safety practices during training exercises and incidents.
- Ensure that responders follow safe practices.

Ensure Availability of Emergency Medical Services

- Coordinate with the Medical Unit Leader to ensure that required emergency medical services are available for incident personnel.
- Maintain periodic communication with the Medical Unit Leader.
- Assess the Site Safety Plan with the Medical Unit Leader, including emergency medical management protocols for a hazardous materials exposure.
- Ensure that rescue devices and an emergency field decontamination plan are in place.
- Review the procedures with personnel.

Make Sure Medical Records Are Maintained

- Ensure that medical records for personnel in the Hazardous Materials Group are maintained.
- Ascertain that exposure records are completed and filed with the Documentation Unit.

Maintain Unit/Activity Log

- Maintain the Unit/Activity Log (ICS Form 214). This important document provides a chronological record of events within each ICS function and position. The Unit/Activity Log is a valuable tool for reviewing the events during an incident, assessing responders' actions, providing protection for the agency, and improving future performance.

California Specialized Training Institute, 2019

Assistant Safety Officer-Hazardous Materials ICS Checklist

Directions: Consider this checklist as a minimum requirement for this position. Feel free to augment this list as necessary.

- ☐ A. Check in and obtain briefing from Incident Safety Officer.
- ☐ B. Obtain briefing from the Hazardous Materials Group Supervisor or Hazardous Materials Branch Director (if activated).
- ☐ C. Participate in the preparation and implementation of a written Site Safety Plan (ICS Form 208).
- ☐ D. Advise the Hazardous Materials Group Supervisor or Hazardous Materials Branch Director (if activated) of deviations from the Site Safety Plan (ICS Form 208) or any dangerous situations.
- ☐ E. Has full authority to alter, suspend or terminate any activity that may be judged to be unsafe in an IDLH condition and/ or involves an imminent danger.
- ☐ F. Ensure the protection of the Hazardous Materials Group or Hazardous Materials Branch (if activated) personnel from physical, environmental, and chemical hazards/exposures.
- ☐ G. Ensure the provision of required emergency medical services for assigned personnel and coordinate with Medical Unit Leader.
- ☐ H. Ensure that medical-related records for the Hazardous Materials Group or Hazardous Materials Branch (if activated) personnel are maintained.
- ☐ I. Maintain Unit/Activity Log (ICS Form 214).

California Specialized Training Institute, 2019

Typical Incidents and Knowledge required

Federal law and regulations require that an Assistant Safety Officer-Hazardous Materials (ASO-HazMat) be appointed for incidents involving hazardous materials. An ASO-HazMat must have the requisite knowledge to carry out his or her responsibilities effectively. In other words, the ASO-HazMat *must* know the inherent hazards for incidents that his or her agency typically responds to and the specific operations that will need to be conducted. Without this knowledge, the Safety Officer or Assistant Safety Officer could endanger responders' safety by failing to recognize the risks that such incidents and the response operations entail.

The chart below provides examples of typical incidents and the knowledge required to effectively carry out response operations.

Incident	Knowledge Required
Structural Fire	' Building construction ' Fire behavior ' Flame spread ' Length of time personnel can operate with SCBAs ' Length of time responders can work before Needing rehab, whether in SCBA or not
Hazardous Materials	' Safe distances for various operations ' Product identification ' Proper selection of chemical protective clothing ' Proper monitoring techniques for environment and personnel ' Principles of decontamination ' Use of technical experts
Emergency Medical Response	' Infection control procedures ' Scene security measures ' Wearing of PPE ' Critical incident stress management ' Mass casualty operations

California Specialized Training Institute, 2019

Safety and risk Management

The primary responsibility of an Assistant Safety Officer-HazMat (ASO-HazMat) is to prevent injury or death. By halting unsafe acts and removing responders from threatening environments, the ASO-HazMat is acting as the incident's risk manager. Although risk management will be discussed in more detail later in this course, this fact sheet introduces three key elements for effective risk management during an emergency response.

Have a Plan

Develop a plan for monitoring the conditions of an incident and for following the actions that will be taken. Checklists can be very helpful for this purpose.

Establish a rehabilitation Area

Designate an area for rehabilitation and ensure adequate supplies. When emergency responders become fatigued, their ability to operate safely becomes impaired. A rehabilitation area provides responders with opportunities to rest, rehydrate, and recuperate from the physical and mental demands of the emergency response. In addition, monitor responders regularly to anticipate and recognize when they are becoming fatigued.

Ensure Proper documentation

Record the events and activities within each ICS function and position through proper documentation. Departments and agencies use such documentation to analyze the actions and events that occurred during an incident and to identify processes for future improvement. Such documentation is especially important in the event of injury or death. Proper documentation can protect the agency from large dollar losses and, in some cases, ensure that workers' rights and benefits are protected. For these and other reasons, it is wise for the ASO-HazMat to become familiar with an agency's needs and procedures for documentation *before* an incident occurs.

California Specialized Training Institute, 2019

The Safety Attitude

Safety is not just a set of practices and procedures employed for an emergency response. Safety is an attitude. Safety is an attitude that translates into safe habits. It is an attitude that should be established during training exercises, carried over to the incident scene, and practiced at all times.

Training in the principles of safety is only as good as the attitude of the person who applies those principles. The Assistant Safety Officer Hazardous Materials (ASO-HazMat) is a role model for safety. The ASO-HazMat should always exemplify this attitude.

Cyclical nature

Safety attitudes are cyclical in nature. Good days are marked by positive safety attitudes; bad days are marked by negative safety attitudes. The in-between days are marked by questionable safety attitudes. These cycles influence the level of vigilance and discipline that individual emergency responders practice toward safety during a hazardous materials incident. A negative attitude toward safety, for example, can cause negative thinking and lead to accidents that result in injury, disability, or death. A positive attitude toward safety, on the other hand, fosters positive thinking and improves efficiency and effectiveness, thus helping to ensure the health and safety of all responders.

Most people will have a tendency to deviate from maintaining high levels of safety vigilance and discipline if it seems the immediate situation does not present an inordinate risk. Inexperienced emergency responders, who may be unfamiliar with how rapidly a stable incident can suddenly escalate out of control, are inclined to view maintaining a high level of safety as "overkill." Lack of fear at a hazardous materials incident may well mean the responder just doesn't understand the potential for injury, illness, or death. By warning each other to be aware of those who think they are immune to injury, experienced emergency responders will help maintain safety vigilance and discipline at incidents involving hazardous materials.

California Specialized Training Institute, 2019

recognizing Safety Cues

Every incident tends to carry potential, and often specific, hazards. Hazardous materials incidents pose myriad threats to health and safety, many of which could result in serious injury or death. These threats to health and safety are a function of the nature of a hazardous materials incident, as well as a consequence of the work being performed. Safety Officers (SOs) and Assistant Safety Officers-Hazardous Materials (ASOs-HazMat) must learn to recognize those potential hazards.

In responding to an incident during an electrical storm, for example, the SO should instruct the entry team to stay away from metal containers and equipment or consider suspending operations. Whenever electrical equipment is involved in incident response, the SO should ensure that all equipment is grounded, especially when transferring flammable liquids. Similarly, in the case of a hazardous materials release, the ASO-HazMat should be aware of shifting winds that might put the command post or decontamination corridor downwind of the incident. Factors, or safety cues, that signal potential hazards may require corrective action or changes to the Incident Action Plan.

Typical Hazards and Safety Cues

The chart below categorizes typical hazards and identifies common safety cues the SO or ASO-HazMat should be alert to.

Hazard	Safety Cues
Chemical Exposure	' Routes of exposure: inhalation, ingestion, absorption, injection ' Point of contact damage or systemic (target organs) ' Acute and chronic exposure
Fire and Explosion	' Chemical reactions ' Ignition of explosive or flammable chemicals ' Ignition of materials due to oxygen enrichment ' Agitation of shock-sensitive or friction-sensitive compounds ' Sudden release of materials under pressure
Oxygen Deficiency	' 21 percent normal atmosphere ' 19.5 percent OSHA for confined space and **no** respirator use ' 16 percent for accuracy of CGI
Radiation Exposure	' Ionizing radiation ' Non-ionizing radiation
Biological and Etiological Agents	' Medical waste ' Poisonous plants ' Insects ' Animals ' Blood-borne pathogens

California Specialized Training Institute, 2019

General Safety	' Holes and ditches ' Precariously positioned objects (e.g., drums) ' Sharp objects (e.g., nails, metal shards, glass) ' Slippery surfaces ' Steep grades ' Uneven terrain ' Unstable surfaces (e.g., walls or floors that may cave in, slick Surfaces of overturned cargo tanks) ' Working around heavy equipment ' Wearing CPC (e.g., impaired hearing, vision, and agility)
Electrical	' Overhead power lines ' Downed electrical lines ' Electrical equipment ' Lightning/electrical storms
Heat Stress	' Most common injury to entry and decontamination teams ' Most important consideration when wearing CPC
Cold Exposure	' Frostbite ' Hypothermia ' Wind-chill factor
Noise	' Responders being startled, annoyed, distracted ' Physical damage to the ear, pain, temporary and/or permanent hearing loss ' Interference with routine communications and any warnings of danger

California Specialized Training Institute, 2019

Anticipating What Might Go Wrong

One of the primary responsibilities of the Assistant Safety Officer-Hazardous Materials (ASO-HazMat) is to anticipate hazardous and unsafe situations. One safety factor that may get overlooked is the level of training and experience of responders. Knowing responders' level of training and experience will alert the ASO-HazMat as to whether responders are operating beyond their capabilities, possibly jeopardizing their own safety or that of others.

Experienced emergency responders tend to use similar procedures and strategies. These basic approaches to emergency response have been developed with safety in mind. Experienced responders understand that being aware of and using such practices can mean the difference between controlling an incident and turning a routine incident into a disaster. In addition, they develop an acute awareness of potential secondary and tertiary hazards. Experienced responders recognize that, whenever hazardous materials are involved, mishandling an incident can pose tremendous threats to life, to the environment, and to property.

Murphy's Law

Regardless of the level of training and experience of responders and the nature of the incident, an ASO-HazMat should *always* anticipate that:

- Something will go wrong.
- Workers will run out of air at the worst possible time.
- Information or advice will be wrong.
- Safety devices will fail.
- Contamination will occur.
- The media will be there even before you arrive.
- Murphy's Law will prevail.

California Specialized Training Institute, 2019

Technical Assistance

To be as effective as possible, the Safety Officer (SO) and Assistant Safety Officer-Hazardous Materials (ASO-HazMat) should have a thorough knowledge of the specific dangers and hazards an incident may present. However, it is unreasonable to expect any individual to be knowledgeable about the inherent dangers of *every* type of emergency incident. As a result, the SO and ASO-HazMat should recognize his or her personal limitations. More importantly, the ASO-HazMat should not attempt to function in areas in which he or she does not possess an adequate knowledge about the dangers and operations necessary to respond to a specific incident.

In some situations, the ASO-HazMat may need the assistance of technical experts, such as when special operations are required or when multiple agencies are involved. In incidents in which multiple victims, leaking product, and large-scale evacuations may occur, the ASO-HazMat will be presented with a multitude of problems. These problems may require the participation of law enforcement, EMS, fire, public works, and a number of other agencies.

Similarly, it may not be practical for the SO or ASO-HazMat to handle all of the responsibilities required in overseeing large-scale incidents or those covering a large area. In that case, the incident's complexity may call for the Incident Safety Officer to appoint assistants to carry out the duties. Having additional support will help ensure that the SO and the ASO-HazMat maintain an effective span of control and not get overloaded. Keep in mind that, at a hazardous materials incident where there is no Safety Officer but an Assistant Safety Officer-Hazardous Materials has been appointed, the Incident Commander is the Incident Safety Officer.

California Specialized Training Institute, 2019

Management Strategies

In this section we will identify some of the different personal staff strategies and the most likely results.

This list is only an example of some of the management styles and how they influence strategy.

This table identifies some management styles and how they tend to influence staff morale and functioning.

Strategy	Result
The Enforcer: **compliance by threat**	' Resentment ' Low commitment, little accomplished when enforcer not present
Ostrich: **passive, hopes everything will be OK**	' No accomplishments
Custodian: **busy with tools of the trade (lots of kits, cameras, signs, etc.)**	' Major issues may not be addressed
Nice Guy: **tries to be everyone's friend**	' Varied (accomplishments tend to be disregarded on tough issues)
Team Member: **uses information and partnerships with functional people**	' High team commitment ' Best long-term accomplishment

California Specialized Training Institute, 2019

Forces of Success and Failure

The attitudes, personalities, and styles shown on the left are those that tend to support success, those on the right tend to defeat success. Use this list to evaluate yourself to predict the likelihood of success or failure.

Driving Forces	Resisting Forces
' new technology	' bad safety image
' track record	' close-minded
' experience	' "don't care" attitude
' presentation	' not needed
' new team	' resisting change
' desire	' not practicing what you preach
' commitment	' learned another way
' boss acceptance	' old habits
' quality of staff work	' redundancy
' visibility	' invisible
	' lack of top-level support

California Specialized Training Institute, 2019

Chapter 2



ICS Forms

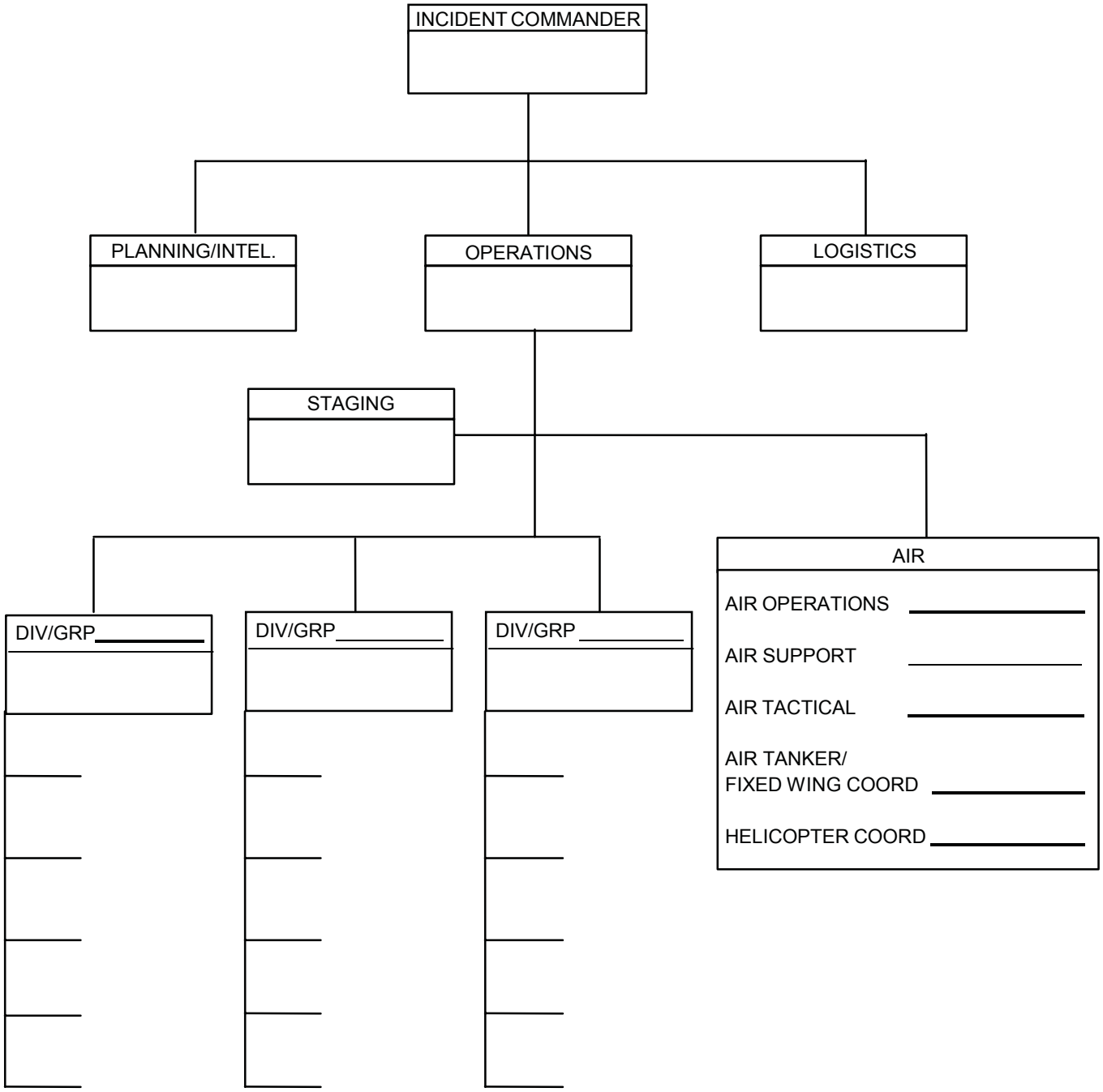
INCIDENT BRIEFING	1. INCIDENT NAME	2. DATE PREPARED	3. TIME PREPARED

4. MAP SKETCH

ICS 201 (SEMS 2001)	PAGE 1	8. PREPARED BY (NAME AND POSITION)

7. SUMMARY OF CURRENT OBJECTIVES AND ACTIONS
CURRENT OBJECTIVES:
CURRENT ACTIONS:

6. CURRENT ORGANIZATION



5. RESOURCES SUMMARY				
RESOURCES ORDERED	RESOURCE IDENTIFICATION	ETA	ON-SCENE 3	LOCATION / ASSIGNMENT

INCIDENT OBJECTIVES

1. INCIDENT NAME	2. DATE PREPARED	3. TIME PREPARED

4. OPERATIONAL PERIOD (DATE / TIME)

5. GENERAL CONTROL OBJECTIVES FOR THE INCIDENT (INCLUDE ALTERNATIVES)

6. WEATHER FORECAST FOR OPERATIONAL PERIOD

7. GENERAL / SAFETY MESSAGE

8. ATTACHMENTS (CHECK IF ATTACHED)

- ☐ ORGANIZATION LIST (ICS 203)
- ☐ DIVISION ASSIGNMENT LIST (ICS 204)
- ☐ COMMUNICATIONS PLAN (ICS 205)
- ☐ MEDICAL PLAN (ICS 206)
- ☐ INCIDENT MAP – (2 MAPS)
- ☐ TRAFFIC PLAN
- ☐
- ☐ PHONE DIRECTORY
- ☐ _____

ICS 202 (SEMS 2001)	9. PREPARED BY (PLANNING / INTELLIGENCE SECTION CHIEF)	10. APPROVED BY (INCIDENT COMMANDER)

MEDICAL PLAN

1. INCIDENT NAME	2. DATE PREPARED	3. TIME PREPARED	4. OPERATIONAL PERIOD

5. INCIDENT MEDICAL AID STATIONS

MEDICAL AID STATIONS	LOCATION	PARAMEDICS	
		YES	NO

6. TRANSPORTATION

A. AMBULANCE SERVICE

NAME	ADDRESS	PHONE	PARAMEDICS	
			YES	NO

B. INCIDENT AMBULANCES

NAME	LOCATION	PHONE	PARAMEDICS	
			YES	NO

7. HOSPITALS

		TRAVEL TIME		PHONE	HELIPAD		BURN CENTER	
NAME	ADDRESS	AIR	GROUND		YES	NO	YES	NO

8. MEDICAL EMERGENCY PROCEDURES

ICS 206 (SEMS 2001)	9. PREPARED BY (MEDICAL UNIT LEADER)	10. REVIEWED BY (SAFETY OFFICER)

SITE SAFETY AND CONTROL PLAN
ICS 208 (SEMS 2001)

1. INCIDENT NAME:	2. DATE PREPARED:	3: OPERATIONAL PERIOD TIME:

SECTION I: SITE INFORMATION

4. INCIDENT LOCATION:

SECTION II: ORGANIZATION

5. INCIDENT COMMANDER:	6. HM GROUP SUPERVISOR:	7. TECH. SPECIALIST – HM REFERENCE:
8. SAFETY OFFICER:	**9. ENTRY LEADER:**	**10. SITE ACCESS CONTROL LEADER:**
11. ASSISTANT SAFETY OFFICER – HM:	**12. DECONTAMINATION LEADER:**	**13. SAFE REFUGE AREA MANAGER:**
14. ENVIRONMENTAL HEALTH:		

15. ENTRY TEAM (BUDDY SYSTEM) NAME	LEVEL	16. DECONTAMINATION ELEMENT NAME	LEVEL
ENTRY 1:		DECON 1:	
ENTRY 2:		DECON 2:	
ENTRY 3:		DECON 3:	
ENTRY 4:		DECON 4:	

SECTION III: HAZARD / RISK ANALYSIS

17. MATERIAL	CONTAINER TYPE	QTY.	PHYS. STATE	pH	IDLH	F.P.	I.T.	V.P.	V.D.	S.G.	LEL	UEL

COMMENT:

SECTION IV: HAZARD MONITORING

18. LEL INSTRUMENT(S):	19. O_2 INSTRUMENT(S):
20. TOXICITY / PPM INSTRUMENT(S):	21. RADIOLOGICAL INSTRUMENT(S):

COMMENT:

SECTION V: DECONTAMINATION PROCEDURES

22. STANDARD DECONTAMINATION PROCEDURES: **YES:** **NO:** **COMMENT:**

SECTION VI: SITE COMMUNICATIONS

23. COMMAND FREQUENCY:	24. TACTICAL FREQUENCY:	25. ENTRY FREQUENCY:

SECTION VII: MEDICAL ASSISTANCE

26. MEDICAL MONITORING	YES:	NO:	27. MEDICAL TREATMENT AND TRANSPORT IN-PLACE	YES:	NO:

COMMENT:

SECTION VIII. SITE MAP

28. SITE MAP:



WEATHER	☐
COMMAND POST	☐
ZONES	☐
ASSEMBLY AREAS	☐
ESCAPE ROUTES	☐
OTHER	☐

SECTION IX: ENTRY OBJECTIVES

29. ENTRY OBJECTIVES:

SECTION X: SOP'S AND SAFE WORK PRACTICES

30. MODIFICATIONS TO DOCUMENTED SOP'S AND WORK PRACTICES	YES:	NO:	

COMMENT:

SECTION XI: EMERGENCY PROCEDURES

31. EMERGENCY PROCEDURES:

SECTION XII. SAFETY BRIEFING

32. ASSISTANT SAFETY OFFICER HM SIGNATURE:	SAFETY BRIEFING COMPLETED (TIME):
33. HM GROUP SUPERVISOR SIGNATURE:	34. INCIDENT COMMANDER SIGNATURE:

UNIT LOG
ICS 214 (SEMS 2001)

1. INCIDENT NAME	2. DATE PREPARED	3. TIME PREPARED

4. UNIT NAME / DESIGNATOR	5. UNIT LEADER (NAME AND POSITION)	6. OPERATIONAL PERIOD

7. PERSONNEL ROSTER ASSIGNED

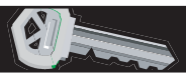
NAME	ICS POSITION	HOME BASE

8. ACTIVITY LOG (CONTINUE ON REVERSE)

TIME	MAJOR EVENTS

TIME	MAJOR EVENTS

Chapter 2



Practical Exercises

Practical Exercises 2.1: Taking Action As the Assistant Safety Officer-Hazardous Materials

Directions: Read each scenario to yourself. Working together in a small group, for each scenario answer the question: What action do you take?

1. You are assigned as the ASO-HazMat at an incident involving an overturned cargo tank. The cargo tank's contents are unknown. Upon checking with operations, you discover that, in an attempt to find a placard, firefighters in turnouts are approaching within 30 feet of the vehicle.

2. A pickup truck has collided with a fire engine that is parked at an incident in which you are the ASO-HazMat. One civilian and one emergency responder are injured.

3. A hazardous materials incident has occurred at a fixed facility. One of the objectives is to close all valves. As the ASO-HazMat, you are unable to determine the origin of the information to develop that objective.

4. A small spill has occurred on the shoulder of a state highway. As the ASO-HazMat, you are concerned that cars are driving too close to the operation, jeopardizing worker safety.

California Specialized Training Institute, 2019

Practical Exercises 2.2: Effectiveness of a Safety Officer

Directions: Working independently, follow the instructions for each section to complete this worksheet.

1. Circle the best answer.

   The most effective long-term staff strategy is:
   - Enforcer
   - Custodian
   - Nice Guy
   - Team Member

2. Draw a line from the strategy to the result that matches.

Strategy	Result
Enforcer	major issues not addressed
Custodian	best long-term accomplishment
Nice Guy	disregarded on tough issues
Team Member	resentment

3. List the following under the appropriate headings:

new technology	experience	drive	management support
bad safety image	don't care	resisting change	old habits
track record	presentation	commitment	visibility
closed-minded	not needed	no management support	

Driving Forces	Resisting Forces

California Specialized Training Institute, 2019

Practical Exercises 2.3: Safety Briefing Instructions

Directions: With your team, review your assigned case study and the accompanying video, if available. Imagine that you are going into the incident as it is developing. As a team, develop a safety briefing that an Assistant Safety Officer-Hazardous Materials would need to cover safety aspects of the incident described in your assigned case study. (Your briefing should focus only on safety issues related to the incident and not attempt to cover an entire Incident Action Plan.) Draw on the knowledge and skills you have acquired in this course, as well as prior knowledge, to develop your safety briefing.

Your team will deliver its safety briefing to the entire group. You will have 5 minutes to present your team's safety briefing. The briefing must include an overview of the scenario, a medical plan (ICS Form 206), a site safety plan (ICS Form 208), and a safety message (ICS Form 202). Your team will also be using additional ICS forms to develop other components of your safety briefing.

Overview

In a few sentences, describe the incident. Be sure to identify any physical hazards as well as any hazardous material that may be involved. If hazardous materials are involved in the incident, mention the target organs and exposure routes for the hazardous material. Also identify the PPE and other equipment personnel should use to minimize exposure to the hazardous materials.

Medical Plan

Based on the scenario for your case study, your team will be developing part of a Medical Plan, which should:

1. Determine the type and number of medical resources needed on the incident and at incident facilities. For example, will anticipated injuries/accidents require:
   - Basic life support
   - Advanced life support
   - Paramedics
   - Ambulance services
   - Medical evacuation aircraft
   - Burn centers
   - Special precautions
   - Other
2. Identify emergency medical procedures that will need to be followed.
3. Identify emergency contact numbers. For example, the name of a local hospital, if available.

California Specialized Training Institute, 2019

Site Safety Plan

Based on the scenario for your case study, at the least, each Site Safety Plan should:

1. Evaluate the risks associated with the operations to be conducted.
2. Identify staffing requirements for the various work teams and key safety personnel.
3. Designate the boundaries of the various work zones.
4. Determine the necessary emergency procedures (escape routes, etc.).
5. Determine decontamination needs.
6. Determine the required level of protective clothing for each of the work zones.
7. If possible, determine the actual type of protective clothing to be used in the exclusionary zone.
8. Determine medical monitoring and treatment needs.

Safety Message

The purpose of the safety message is to list observed or projected hazards and risks (such as slip, trip, and fall hazards; rolling or falling debris; worker fatigue; etc.). No specific format is required for the safety message. It may be a presented as a simple outline, in several paragraphs, or in some other written manner.

Whatever the format, the safety message must be easy to follow, clear, and concise. In general, safety messages should identify:

- Specific risks and hazards
- What to look for to avoid the specified risks and hazards
- Where the risks and hazards are likely to occur
- Probable results (damage and/or injuries) if risks and hazards are not recognized

Other Safety Briefing Components

ICS Form 201 (Incident Briefing)

- Use page 1 of this form to develop a map of the incident area.
- Use page 2 of this form to list the broad incident objectives.

ICS Form 202 (Incident Objectives)

- Use this form to list general control objectives and the current weather.
- Use this form as a guide for your team's development of the safety message.

ICS Form 206 (Medical Plan)

- Use this form as a guide for your team's development of the Medical Plan.

ICS Form 208 (Site Safety and Control Plan)

- Use all sections of this form to develop your site safety plan and as the basis for your safety briefing.

ICS Form 214 (Unit Log)

- Use this form to record at least two significant actions taken or events that occurred in your case study.

California Specialized Training Institute, 2019



2.3 Case Study Scenarios

Scenario 1: Cincinnati, Ohio

Type of Accident

Hazardous Materials Release

Circumstances of Incident

At 12:08 a.m. on December 15, 1998, the Cincinnati Fire Division responded to an emergency call about a chemical spill at the property of Hilton-Davis Inc., located at 2235 Langdon Farm Road. Three thousand gallons of 95 percent nitric acid was transferred from an onsite storage tank, which needed to be repaired, to a tanker truck. Following the transfer, a leak was discovered on the tanker truck. A defective gasket on the tanker truck was the source of the leak.



Hilton-Davis, Inc.

The acid spill was contained to the Hilton-Davis materials storage area. The resulting nitric acid vapor cloud measured approximately three-quarters to one mile wide and one to two miles in length. However, monitoring of the area indicated that concentration levels of nitric acid outside the plant were well below a cause for concern. No evacuations were ordered and no exposures were reported.



The City of Cincinnati Department of Health, the Office of Environmental Management, and the Sewer Department also responded to the spill. These agencies monitored the air quality at the scene and surrounding area to track the vapor cloud and provide information to the Fire Chief and response staff. Other agencies that responded to the incident include the Cincinnati Police Division, Norwood and Golf Manor Fire Departments, U. S. Environmental Protection Agency, Ohio Environmental Protection Agency, Hamilton County Emergency Management Agency, and the Hamilton County Sheriff's Department. Hamilton County and Millcreek Valley Communications provided communications support, and the Hamilton County Hospital Disaster Network was placed on alert status.

At approximately 12:58 a.m., the Fire Division notified the public in the area surrounding the plant about the spill and requested that they "shelter in place." The directive to shelter in place asks that the public stay indoors. This is a standard safety measure to protect the public during many types of hazardous material incidents. To shelter in place,

California Specialized Training Institute, 2019

anyone in the affected area also is asked to close windows and doors and to turn off heating and air conditioning systems that bring fresh air into the structure. The directive to shelter in place was lifted at approximately 5:30 a.m. Response personnel remained on the scene until 7:13 a.m. The chemical spill did not result in injuries or fatalities.

Cause(s)

Causes of this accident include:

- The hose of the truck delivering nitric acid was mistakenly connected to the pipe for the wrong chemical.
- The contact and coordination procedures for chemical delivery work were insufficient.
- Safety and health education for workers was insufficient.

Incident Specifics

Temperature: 76°F

Wind: 7mph NE

RH: 68%

video

"Nitric MC 312"

documents

None

California Specialized Training Institute, 2019

Scenario 2: Cajon Pass, California

Type of Accident

Hazardous Materials Release

Circumstances of Incident

Shortly after 4:00 a.m. on Thursday, February 1, 1996, a freight train derailment, involving four locomotives and 45 of 49 freight cars, occurred at Cajon Pass, California. The derailment occurred on a descending 3 percent grade at milepost 60.7, approximately four miles west of the summit and 20 miles east of San Bernardino on the south side of a curve in the westbound track. The track was closed for one-and-a-half days. Many of the derailed freight cars contained hazardous materials, such as butyl acrylate, trimethyl phosphite, methyl ethyl ketone, petroleum distillates, ethylene glycol, or denatured alcohol.



Cajon Pass, California

In a quarter-mile inferno, 38 of the 49 cars, including cars containing butyl acrylate and trimethyl phosphite, were burning or their contents were exposed. The derailment produced a toxic cloud one-half mile in diameter. Dikes had to be built on an adjacent creek to prevent run-off contamination. Twenty-four people were treated and released, including two firefighters, eighteen Highway Patrol officers, and the engineer. More than 2,000 residents were evacuated.


Responders Inspecting Derailment

On the third day, rumbling noises were detected in a car containing butyl acrylate. All personnel were withdrawn. This rail car required a vent and burn operation to relieve the pressure in the tank. (In order to prevent polymerization, butyl acrylate must always be stored under air, and never under inert gases. The presence of oxygen is required for the stabilizer to function effectively. It has to contain a stabilizer and the storage temperature must not exceed 35°C.)

Threat of injury from poisonous smoke closed a 20- mile stretch of Interstate 15 alongside the tracks and forced the evacuation of several hundred residents in the surrounding area. Interstate Highway 15 between San Bernardino and the Las Vegas areas was also closed. The wreckage left chemicals seeping into the ground, potentially contaminating the area's water supply.

The derailment occurred when the train entered a more than 7 degree curve at a speed estimated to be in excess of 50 mph (maximum operating speed

California Specialized Training Institute, 2019

at that location is 25 mph). Reports on the disaster showed that the emergency brakes worked on only the first 10 out of 49 cars. The brakeman and conductor jumped off just before the train hurtled off the tracks, but the incident resulted in fatal injuries to both, and serious injury to the engineer. The train consist included hazardous material cars that subsequently caught fire. Area residents were evacuated and highways were closed, including Interstate 15.

Cause(s)

Causes of this accident include:

- Excessive speed on downhill (westbound) track.
- Loss of air pressure resulting in failure of emergency air-braking operation.
- Brake line blockage probably occurring between the fifth and sixth cars of the train.

An administrator with the Federal Railroad Administration told a House of Representatives subcommittee that agency inspectors had checked the 49-car freight train that derailed in California on February 1 before it began its trip. However, inspectors had not noticed that a braking device on board had broken. If the braking device had been working, it might have prevented the accident, the administrator said.

Prior to 1990, each caboose was equipped with a conductor's emergency brake valve. With the conductor's emergency brake valve, the conductor had the option of venting the brake pipe air and applying the brakes from the rear of the train if a problem or hazardous condition occurred. When cabooses were removed from service, this ability to initiate an emergency brake application from the rear of the train was lost.

The two-way, end of train device incorporates this additional feature. The engineer can command an emergency brake application at the rear of the train by flipping a toggle switch in the locomotive cab. When the toggle switch is flipped, the two-way, end of train device will open the end of the brake pipe and vent all of the air, thus triggering an emergency brake application from the rear of the train. Safety Board investigators believe that two-way, end of train devices are essential to the safe operation of caboose-less trains, because they offer the only effective means of stopping a train if the train line is blocked by a turned angle cock, crimped air hose, frozen air line, or other such circumstances.

Incident Specifics

Temperature: 66°F

Wind: 10 mph W

RH: 70%

video

"Cajon Pass"

documents

Incident Action Plan: Day Shift

California Specialized Training Institute, 2019

Scenario 3: Seacliff, California

Type of Accident

Hazardous Materials Release

Circumstances of Incident

On July 28, 1991, at 12:07 p.m., a 46-car northbound train derailed beneath the Highway 101 overpass at the costal community of Seacliff, California. This Southern Pacific Transportation Company derailment cut off the main access from Ventura to Santa Barbara. In addition, more than 400 residents of Seacliff, La Conchita, and Mussel Shores were evacuated for six days as prevailing winds blew a plume of hydrazine toward the communities, which are located approximately 200 yards from where the spill zone occurred.



Aerial View of Accident Site

Fourteen cars piled up in the incident. Eighty drums of 51 percent aqueous hydrazine were being transported in an intermodal "piggyback" box. Twenty-three drums ruptured and their contents were exposed. In addition to the hydrazine, large quantities of polyurethane pellets spilled over the distance of the derailment. The California Highway Patrol subsequently closed both Highways 1 and 101.



Cause(s)

The cause of this derailment seems to have been an overheated journal bearing, which resulted in axle failure.

Incident Specifics

Temperature: 66° F

Wind: 5-8 mph SW

RH: 86%

video

"Seacliff"

documents

Incident Action Plan: Day Shift

California Specialized Training Institute, 2019

Scenario 4: Shasta, California

Type of Accident

Hazardous Materials Release

Circumstances of Incident

At 9:50 p.m. on July 14, 1991, a Southern Pacific train consisting of four locomotives, 86 empty cars, and 11 loaded cars derailed near Dunsmuir, California. The fifth car (a DOT Class 111A) in the derailment fell into the Sacramento River, was punctured, and spilled about 13,000 of the 19,000 gallons of the metam-sodium herbicide it was carrying.



Cantera Loop, California

The Cantera Loop, five miles north of Dunsmuir, was the site of a tragic derailment and toxic chemical spill. The spill killed everything in the river for 40 miles, including thousands of wild trout, threatened drinking water supplies, and otherwise resulted in significant environmental damage to a major northern California tourist area. The spill was contained just before it reached Shasta Lake, 43 miles to the south.



Train car leaking metam-sodium into the Sacramento River

When mixed with water, metam-sodium degrades to methylisothiocyanate (MITC) and other gases. The contaminated river water passed the town of Dunsmuir and other occupied areas, exposing residents to MITC gas. A total of 360 people underwent triage. The majority of patients displayed minor exposure symptoms that did not require hospital care. Fifteen days after the incident, a total of 244 exposed patients had been seen at the Mercy Medical Center Mt. Shasta emergency department. Five patients had been admitted, three of whom had symptoms that could have been related to the spill.



Stretch of contaminated river near Dunsmuir, California

California Specialized Training Institute, 2019

Cause(s)

A preliminary Southern Pacific investigation found that a multitude of contributing factors probably caused the derailment. As the train moved up the 2.2 percent Cantera grade and around a 14-degree curve above the river, "it appears that a momentary wheel slip on one or more of the locomotives may have created a drawbar stress, in which the cars attempted to straighten their forward motion as they rounded the curve," noted Southern Pacific President Mike Mohan. Train composition may also have been a factor.

Incident Specifics

Temperature: 65° F

Wind: 6 mph E

RH: 77%

video

None

documents

Incident Action Plan: Day Shift

California Specialized Training Institute, 2019

Scenario 5: norfolk, virginia

Type of Accident

Hazardous Materials Release

Fire

Circumstances of Incident

At about 9:00 a.m. on September 3, 1984, an MC 306 cargo tank owned by Exxon Corporation was struck by a Browning-Ferris Industries garbage truck. The collision resulted in a puncture of the non-pressure container holding more than 8,000 gallons of multi-grade gasoline. The resulting fuel spill produced both surface (gutters) and subsurface (storm drain) fires, destroying multiple private vehicles and draining into the Chesapeake Bay. The storm drain fire swept out along both sides of a twelve-story convalescent care facility.

One firefighter was injured when he fell into an open compartment while conducting foaming operations from the top of the tank. The interior of his right thigh was lacerated down to the femur.

Cause(s)

Vehicle accident involving improper backing operation.

Incident Specifics

Temperature: 76° F

Wind: 7mph NE

RH: 83%

video

"Norfolk, Part 1"

"Norfolk, Part 2"

documents

None

California Specialized Training Institute, 2019

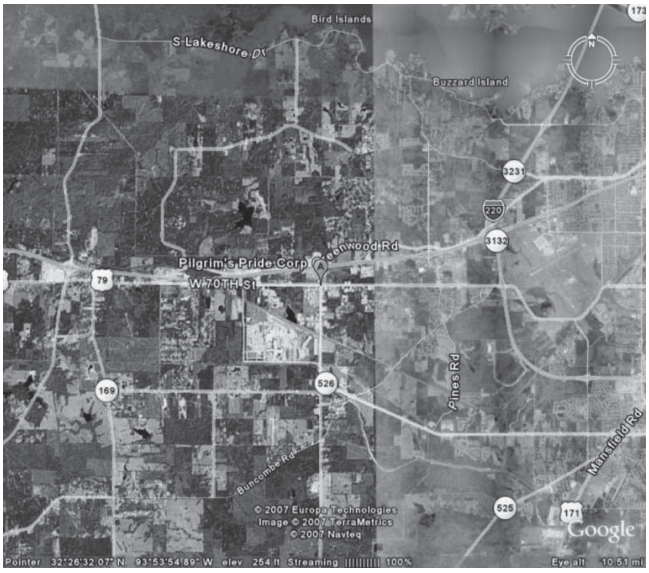
Scenario 6: Shreveport, Louisiana

Type of Accident

Hazardous Materials Release

Circumstances of Incident

On September 17, 1984, an anhydrous ammonia leak occurred in the pipes of a cold storage facility owned and operated by Pilgrim's Pride Company, in Shreveport, Louisiana. The leaking anhydrous ammonia was involved in an explosion at the cold storage warehouse. Two firefighters were engulfed in the explosion's flames and one firefighter died.



Pilgrim's Pride Cold Storage, Shreveport, Louisiana

Several days prior to the accident, employees smelled ammonia and located a leak in the refrigeration system. Steps were taken to isolate the system and repair a leaky valve at the evaporator unit. As the repair crew worked, ammonia continued to accumulate in the room. The crew tried to absorb the gas, using a 50-pound cylinder of carbon dioxide. (This method has been effective for absorbing small amounts of ammonia, but has not been recommended for large leaks). When the carbon dioxide contacted moist room air, it condensed. The ammonia also condensed, greatly reducing visibility.

The gaseous atmosphere became unbearable for the workers, who were wearing industrial type filter masks or chemical respirators, not full protective equipment. The workers left the room and called the fire department to borrow full protective gear. When the firefighters arrived, they were told that the leak had been isolated, that the leak had not been prolonged, and that only residual gas remained. Water was sprayed in the room to absorb the ammonia, and a fan was set up. After considering various alternatives, the firefighters decided to use an electric fork lift truck to replace the valve, which was located 17 feet above the floor. The floor was very slippery, and the truck slid into an interior wall and the concrete curb at its base. An explosion occurred immediately. One firefighter was unable to escape or remove his burning suit.

There were no ammonia leakage detectors, no hazard notification alarms, and no emergency ventilation systems. An ammonia pipe leak in one of the -12ºF cold storage rooms was being repaired with the help of members of the Shreveport Fire Department's Hazardous Material Unit. The source of ammonia was not properly isolated and ammonia continued to leak into the room during the repair.

Cause(s)

Occupants of the room effecting repairs wore protective suits and received no warning of the increasing ammonia concentration. Eventually, a forklift truck being used for the repair work accidentally struck a building structural element, creating a spark that ignited the ammonia vapor resulting in an explosion. This occurred largely due to the failure of everyone involved to recognize the fire and explosion hazard presented by anhydrous ammonia. As a result, the cold storage rooms at this facility were not equipped with fire defenses

California Specialized Training Institute, 2019

matched to this hazard. (NFPA Fire Investigations Report, "Cold Storage Warehouse, Shreveport, LA, September 17, 1984," National Fire Protection Association, Quincy, MA).

Incident Specifics

Temperature: 40° F

Wind: Not applicable

RH: Not applicable

video

"Dixie Cold Storage"

documents

None

California Specialized Training Institute, 2019

Scenario 7: Hartford, Maryland

Type of Accident (Training Exercise)

Weapon of Mass Destruction Release

Circumstances of Incident

On June 25, 1999, a suspicious-looking Caucasian male left a small paper bag by a garbage can in the Hartford, Maryland, shopping mall. When a mall worker placed the bag into the trash, the bag apparently burst its contents and the worker immediately fell to the floor. Several women ran to his aid, thinking he had suffered a heart attack.



Hartford Mall, Maryland

A TV crew was nearby filming a commercial. The announcer and the cameraman also ran to the scene; both died. 911 had been called with the information of an apparent heart attack. The four emergency responders died. In total, ten people died, twelve were hospitalized, and dozens more sought medical care.

Symptoms exhibited by the victims included runny nose; watery eyes; small, pinpoint pupils and eye pain; blurred vision; drooling and excessive sweating; chest tightness; and rapid breathing.

Cause(s)

Intentional Act

Incident Specifics

Temperature: 70˚ F

Wind: Not applicable

RH: Not applicable

video

"Hartford Mall"

documents

None

California Specialized Training Institute, 2019

Scenario 8: Texas City, Texas

Type of Accident

Hazardous Materials Release

Circumstances of Incident

On October 30, 1987, more than 2,000 people close to a nearby Marathon Oil Company refinery were immediately evacuated from their homes and businesses in Texas City, Texas, after a cloud of hydrofluoric acid was accidentally released from a nearby Marathon Oil Company refinery.



Black circle indicates Marathon Oil Corp., small circle represents accident site



Overall, approximately 4,000 people were evacuated from commercial and residential areas as the plume continued to spread. No deaths resulted from the release. However, the three area hospitals treated 1,037 patients, of which nearly 100 were hospitalized. Most of those hospitalized were treated for minor respiratory, skin, and eye irritations. Extensive damage occurred to trees and vegetation in the residential area.

A statement released by the American Petroleum Institute noted that, "To the best of our knowledge, the release in Texas City on October 30 was the most significant petroleum-related incident in the United States involving hydrofluoric acid over its 45-year history of use in the petroleum industry."

In a statement relayed by Robert Getts of the Los Angeles-based Western Oil and Gas Association, new tests conducted in the Nevada desert indicate that a 1,000-gallon spill of hydrofluoric acid could be lethal to those living within five miles of the refineries and "immediately dangerous to life and health" as far away as seven-and-a-half miles.

Cause(s)

On October 30, 1987, a crane carrying a 50-foot section of a convection heater dropped its load onto an anhydrous hydrogen fluoride tank within the hydrogen fluoride alkylation unit, shearing two lines leading to the top of the tank. One line was a four-inch acid truck loading line and the other was a two-inch tank pressure relief line. Approximately 6,550 gallons of hydrogen fluoride were accidentally released.

The tank was at the normal operating pressure of approximately 125 psi. As the tank depressurized, a cloud of hydrogen fluoride was produced, which moved with the prevailing wind. The tank originally contained 35,700 gallons of anhydrous hydrogen fluoride, of which about 6,548 gallons were released over a 44-hour period, although the majority of the release took place during the first two hours as the tank depressurized. The release also included

California Specialized Training Institute, 2019

some light hydrocarbons (primarily isobutane) and water vapor.

Incident Specifics

Temperature: 70˚ F

Wind: Not applicable

RH: Not applicable

video

"Texas City"

documents

None

California Specialized Training Institute, 2019

Scenario 9: Bophal, India

Type of Accident

Hazardous Materials Release

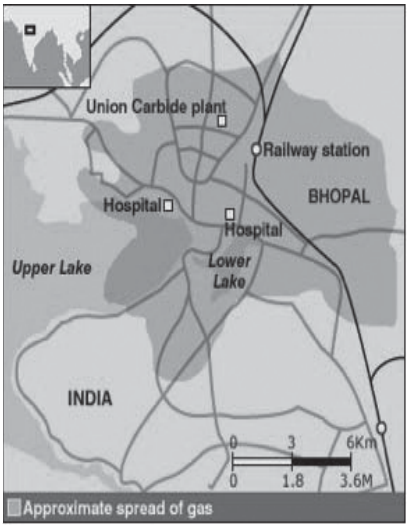
Circumstances of Incident

Late in the night of December 2, 1984, an explosion at the Union Carbide (Dow Chemical) plant in Bhopal, India, released a deadly cocktail of poison gas. Winds carried the clouds of gas, which were made up of methyl isocyanate (MIC), hydrogen cyanide, monomethyl amine, carbon monoxide, and up to 20 other chemicals, over the surrounding community. More than 500,000 people were exposed to the poisons. Two thousand to 3,400 people died almost immediately; approximately 8,000 more died gradually from exposure to the killing fumes.



Union Carbide, Dow Chemical

The gas polluted an area of more than eighteen square kilometers and displaced more than 500,000 people. At least 250,000 people were injured as a result of this accident. The MIC gas caused severe respiratory distress, pulmonary edema, eye and lung diseases, gynecological problems, psychological crisis, and many other medical problems before it had run its course.



The sheer magnitude of the accident drew more than 12,000 personnel from relief operations to the area in hopes of rendering aid, but for many of the victims, it was already too late (Bisarya & Puri, 2001; EPA, 2001; Nolan & Street, 2000).

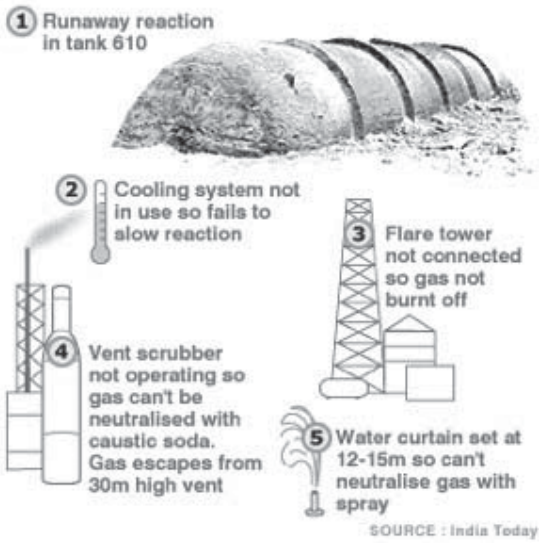


Bophal, India

Cause(s)

The incident occurred during routine maintenance operations at the factory when a large quantity of water entered one of the storage tanks through leaking valves and corroded pipes, triggering a runaway reaction.

California Specialized Training Institute, 2019



Factors contributing to the magnitude of the disaster

Incident Specifics

Temperature: 40˚F

Wind: 8 N

RH: 44%

video

"Bophal, Part 1"

"Bophal, Part 2"

documents

None

California Specialized Training Institute, 2019

Scenario 10: Tokyo, Japan

Type of Accident

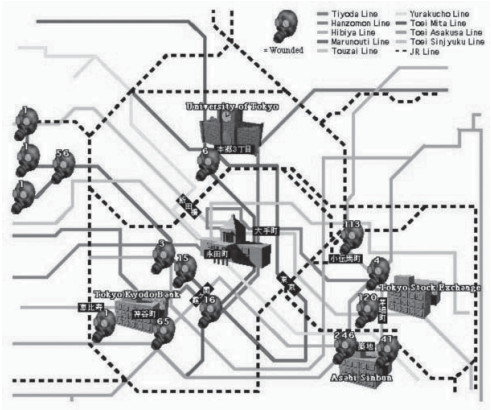
Hazardous Materials Release

Circumstances of Incident

The March 20, 1995, sarin attack on the Tokyo subway was an act of domestic terrorism perpetrated by members of Aum Shinrikyo, a religious cult. In five coordinated attacks, the conspirators released sarin liquid on several lines of the Tokyo Metro, killing twelve people and exposing nearly a thousand others. The attack was directed against trains passing through Kasumigaseki and Nagatacho, home to the Japanese government.

The attack came at the peak of the Monday morning rush hour on one of the world's busiest commuter transport systems. The Tokyo subway system transports millions of passengers daily. During rush hour, trains are frequently so crowded that it is nearly impossible to move.

On the day of the attack, ambulances transported 688 patients, and nearly five thousand people reached hospitals by other means. Hospitals saw 5,510 patients, 17 of whom were deemed critical, 37 severe, and 984 moderately ill. The cases classified as moderately ill complained mostly of vision problems. Most of those reporting to hospitals were the "worried well" and had to be distinguished from those who were ill.

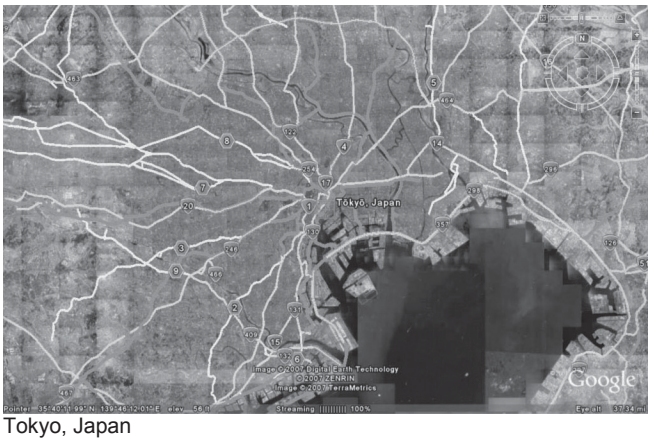


California Specialized Training Institute, 2019

Locations of sarin exposure on the Tokyo subway

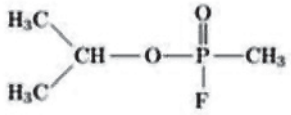
By mid-afternoon, the mildly affected victims had recovered from the eye irritation and were released from hospital. Most of the remaining patients were well enough to go home the following day, and within a week only a few critical patients remained in hospital. The death toll on the day of the attack was eight, and it eventually rose to twelve.

Witnesses have said that subway entrances resembled battlefields. In many cases, the injured simply lay on the ground, many unable to breathe. Several of those affected by the sarin went to work in spite of their symptoms, not realizing they had been exposed to a hazardous substance. Most of the victims sought medical treatment as the symptoms worsened and as they learned of the actual circumstances of the attacks via news broadcasts.



Tokyo, Japan

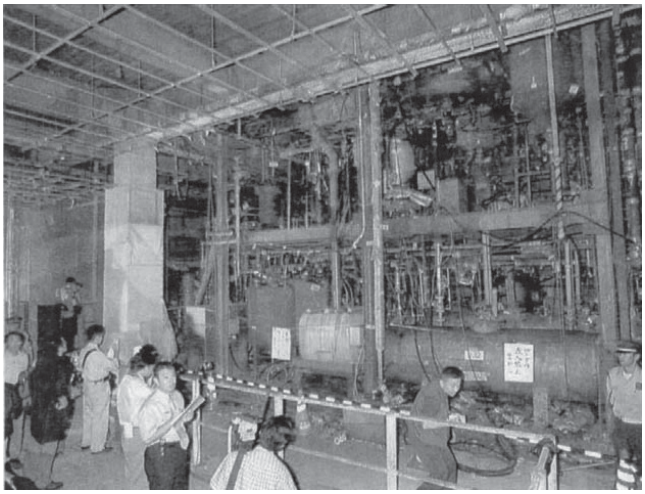
Several of those affected were exposed to sarin only through helping others who had been directly exposed. Among these were passengers on other trains, subway workers, and health care workers. *(Wikipedia: The Free Encyclopedia).*



Chemical Formula for Sarin

Cause(s)

Ten men were responsible for carrying out the attacks; five released the sarin, while the other five served as get-away drivers. The liquid sarin was contained in plastic bags, which each team then wrapped in newspapers. With one exception, each perpetrator carried two packets of sarin, totaling approximately one liter of sarin. One may carried three bags of sarin. A single drop of sarin the size of the head of a pin can kill an adult.


Aum Shinryko Sarin Production Lab

Carrying their packets of sarin and umbrellas with sharpened tips, the perpetrators boarded their appointed trains. At prearranged stations, each perpetrator dropped his package and punctured it several times with the sharpened tip of his umbrella before escaping to his accomplice's waiting get-away car.

Incident Specifics

Temperature: 58° F

Wind: 3 mph E

RH: 78%

video

"Tokyo, Part 1"

"Tokyo, Part 2"

documents

None

California Specialized Training Institute, 2019

Scenario 11: Salt Lake City, utah

Type of Accident

Hazardous Materials Release

Circumstances of Incident

On Sunday, March 6, 2003, a rail tanker car in South Salt Lake City, Utah, began leaking what was reported to be a mixture of acids, sending a small haze of orange gases into the air and forcing the evacuation of 6,000 people from homes and businesses for about seventeen hours. No injuries were reported. Major roads were closed, including portions of the I-15 and I-80 freeways. Workers found the leak around 05:30 in the Roper Rail Yard near 2270 S. 600 West. By nightfall, an estimated 21,000 litres (5,500 US gallons) had leaked from three holes in the car, which originally contained 51,300 litres (13,500 US gallons). The tank car was also visibly marked 'sulfuric acid.'



Roper Rail Yard

South Salt Lake Fire Chief Steve Foote reportedly said, "It's waste acid. It was used in a manufacturing process, and now that rail car's leaking." He described the tank's leaks as looking like " ... big white softballs that are all along the railcar ⋯ It's just bubbling like big blisters along the side of that tank. And these are not blisters caused by paint. It's not the paint blistering. It's the actual metal itself." He suspected that the liner, normally made of a rubberized substance that separates the acid from the steel tanker, had failed. The phenolic liner had essentially been painted on and then baked inside the tank. Foote also commented that the liner is designed to serve as insulation between the tanker and sulfuric acid only. The necessary special equipment to transfer the tank's contents was brought in from Las Vegas around 22:00.

With the car's structure compromised, workers dared not climb its ladder to attach a hose and begin pumping out acids. Instead, they planned on using a specialized machine to puncture the wall of the tank, insert a hose, and begin pumping the acid into holding tanks. Even that took several attempts. "The acids that were eating away at the tanker also began eating through the hoses and other equipment being used to pump the material. These (acids) are all very aggressive when it comes at eating away at things like that," Foote said. The container was weakened so much by the acid that Foote's crews could stick a ballpoint pen through its metal wall.



Entry team inspects leak

California Specialized Training Institute, 2019

The incident was marked by great confusion over the contents of the tank, with one press report referring not only to "caustic acids" but also to "acid caustics." Emergency crews were initially told the tank contents were a mixture of sulphuric, nitric, hydrofluoric, and hydrochloric acids. Late in the operation, authorities were told the mixture might include phosphoric, acetic acid, and ammonia. Fire officials said the rail car's manifest indicated it was carrying sulphuric and hydrofluoric acids to Ohio. According to a spokesman for the car's owner, Kennecott Utah Copper, nothing other than sulphuric acid should have been in the tanker: "Our contract is specific: That it is to be for sulphuric acid transport—that's what the car is designed for. Undeniably, there is something in there that is not compatible with the design and specifications of how that car is supposed to be used."



Site of Accident

After the tanker was drained, it was moved off the tracks into a large dirt area. The tracks and railroad ties on which the tanker rested and the 300-by-60-foot section of dirt under it were removed and neutralized. Foote said all of that will have to be rebuilt and new dirt brought into the area.

Cause(s)

The railroad tank car that leaked toxic fumes was not designed to hold the mixture of highly corrosive acids with which it had been filled, the car's owner said.

By the next day (March 9), the Utah Department of Health laboratory had determined that the mixture was about 6 percent hydrofluoric acid, 1 percent nitric acid, 6 percent sulphuric acid, 1 percent acetic acid, 2 percent hydrochloric acid, 2 percent ammonia, 0.5 percent phosphoric acid, and the rest was water.

Fire Chief Foote also said, "Basically, it's an environmental crime. It just doesn't seem to add up as far as what we've been told is in there, versus what actually happened out there. The tanker car originally carried 13,000 gallons of 94 percent nitric acid from Kennecott Utah Copper to Darwin, Nevada, where the tanker car, sublet to another company, was then loaded with the industrial waste—whatever it was—and the train arrived at the Roper Rail Yard in South Salt Lake shortly after 05:15. It was supposed to be taken to Ohio, where the waste was to be solidified and buried, but the tanker was found to be leaking. Officials had spent all day trying to find out from a company they first identified as Phillips Environmental, but later called Philip Services, what the tanker contained."

Incident Specifics

Temperature: 40° F

Wind: 5 mph W

RH: 42%

video

None

documents

None

California Specialized Training Institute, 2019

Scenario 12: denver, Colorado

Type of Accident

Hazardous Materials Release

Circumstances of Incident

On April 3, 1992, at approximately 4:08 a.m. in the Denver switching yard, a tank car with Nitric Acid stenciled on its side began leaking from its lower section. The tank car contained 99.1 percent concentrated nitric acid. The resulting spill covered an area of approximately 300 feet in diameter and produced a large vapor plume.

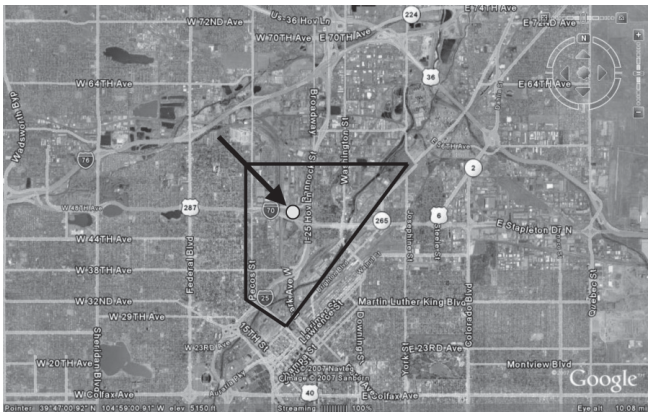
An evacuation area of one-half mile by one mile (later extended to two miles) was initiated, involving approximately 9,000 homes and businesses, two hospitals, and between 22,000 to 25,000 people. The evacuation area was located at Interstate-70 and Interstate-25, between Pecos Street and Brighton Boulevard and south of 52nd Avenue to 20th Avenue.



Accident Site

A decision was made to neutralize the spill using soda ash (sodium carbonate, Na2CO3). A mobile snow blower was requested from the nearby Denver International Airport. Heavy equipment piled the soda ash and the snow blower then drove through the piles to disseminate the material.

The incident lasted for almost three days and resulted in eleven minor injuries (nine civilians and two responders.



Incident area showing initial evacuation area

Cause(s)

While attempting to entrain the tank car containing nitric acid to an outbound train, the car was "humped" at a speed greater than permitted, causing the tank car to be pushed into a boxcar coupling. The coupling created a hole in the lower portion of the tank car.

Incident Specifics

Temperature: 35° F

Wind: 6 mph N

RH: Occasional snow

video

"Denver Nitric"

documents

None

California Specialized Training Institute, 2019

Scenario 13: Anaheim, California

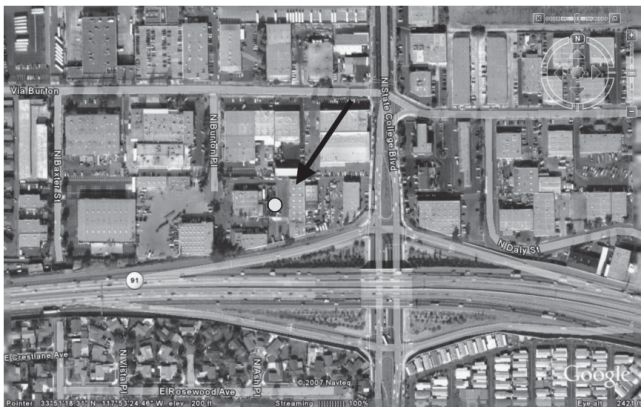
Type of Accident

Pesticide Fire

Circumstances of Incident

The incident began at approximately 10:45 p.m. on Saturday, June 24, 1985, when the Larry Fricker Fertilizer Company, located at 1421 N. State College Boulevard, erupted in flames. The fire lasted four days and forced the evacuation of thousands from the area surrounding the site. The Fricker warehouse stored more than 180 chemicals, including organophosphates and carbamates. These poisons can burn the skin and eyes and are fatal, if enough is swallowed, inhaled, or absorbed through the skin. Many of the stored chemicals, such as 60 pressurized containers of methyl bromide and chloropicrin gas, are highly toxic. The fire at the chemical storage plant sent toxic fumes into the skies over Anaheim and the surrounding communities.

Freeway 91 Freeway was closed, backing up traffic for eight miles in each direction. Residents were displaced for two days while firefighters worked to bring the situation under control. Once responders determined that pesticides were involved, the application of water for extinguishment was ceased. Unfortunately, the fire was never hot enough to consume the chemicals involved. Another plan had to be found.



Accident Site

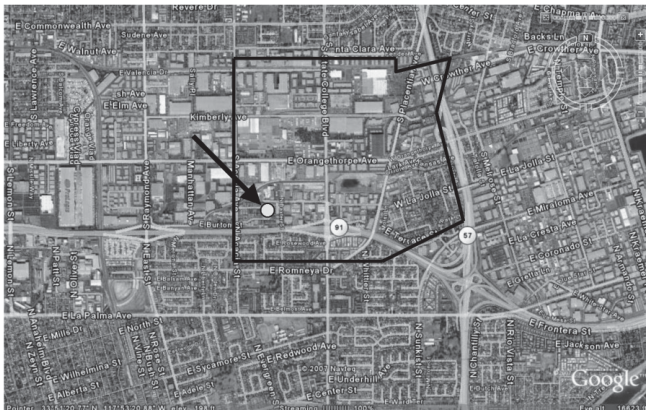
The Orange County hazardous materials team was called in to provide a higher level of protection and operational capabilities. In addition, the U.S. Coast Guard toxic waste team and the U.S. Environmental Protection Agency (EPA) were called in to assist as shifting winds spewed poisonous fumes into the air across Anaheim and into the neighboring Orange County cities of Placentia and Fullerton. High expansion foams were later used in an attempt to extinguish the smoldering piles.

Eventually, decontamination and PPE supplies were exhausted. As a result, operations were temporarily halted until the supplies could be replaced. Two of the three remaining smoldering piles were extinguished using standard methods. The third and largest) pile contained unknown chemicals. A slurry of water, foam, and sand was then used, producing a significant reaction that coated responders with a thick "muck" of contamination.

The first evacuations took place on Sunday afternoon, fourteen hours after the fire was reported at the Larry Fricker Company fertilizer and pesticide warehouse. About 7,500 people were evacuated from their homes and businesses in the immediate area. By the second day of the incident, winds lofted toxic fumes from the smoldering chemical fire over a wider area, raising to about 11,500 the number of people evacuated their homes and businesses, officials said. Up to 4,000 evacuees were not allowed to return home for more than three days until the fire in the pesticide and fertilizer warehouse was extinguished.

EPA and Coast Guard clean-up operations lasted for fifteen days.

California Specialized Training Institute, 2019



Greater Incident Evacuation Area

Cause(s)

Unknown

Incident Specifics

Temperature: 80˚F

Wind: 5mph SW

RH: Occasional rain

video

"Fricker Fire"

documents

None

California Specialized Training Institute, 2019

Laws and regulations



Scope

This chapter explains how laws, regulations, plans, policies, and standard operating procedures play an important role in assuring safety during responses to hazardous materials incidents.



Terminal Learning Objective (TLO)

At the end of instruction for Chapter 3, participants will be able to use laws, regulations, standards, plans, and policies as tools in planning a safe response to a hazardous materials incident.



Enabling Learning Objectives (ELOs)

This chapter's enabling learning objectives are to ensure participants will have the capability to:

1. Describe the regulatory background for protecting worker health and safety.
2. Define statutory law and case law.
3. Explain the role that regulations and codes play in ensuring safe responses to hazardous incidents.
4. Describe the process for developing consensus and performance standards.
5. Summarize the interrelationships among policies, plans, standard operating procedures (SOPs), and checklists.

Supporting Materials/resource List

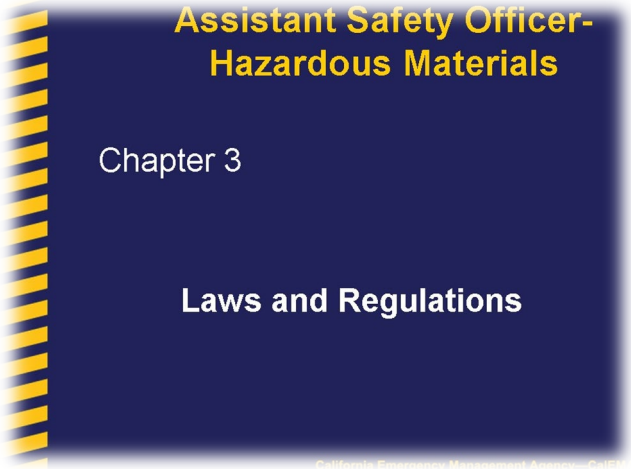
See Supporting Materials/Resource List section starting on page 139.



Practical Exercises

See Practical Exercises section starting on page 155.

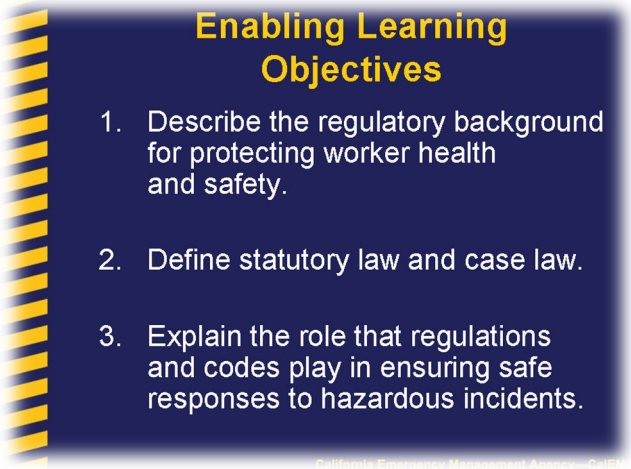
California Specialized Training Institute, 2019



Slide 3.1

The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

- (Res.B.2 1.3) Develop plans, procedures, and protocols for public safety.
- (Res.B.2 5.2) Establish and implement on-scene management for hazmat response utilizing ICS.
- (Res.B.2 5.3) Conduct hazmat response (implement plans, programs, agreements, and requirements).



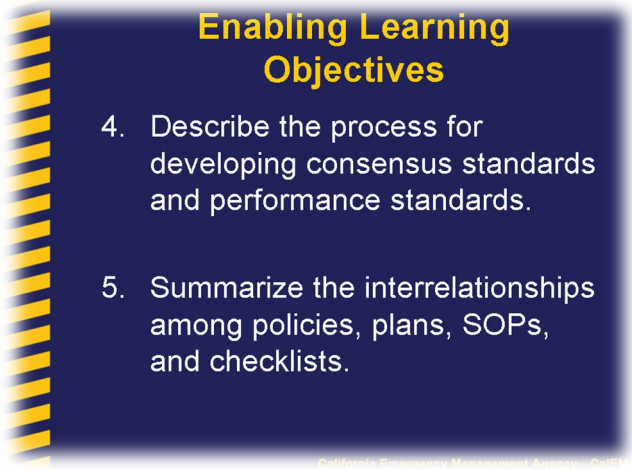
Slide 3.2

The goal (terminal learning objective) of this chapter is to ensure that participants will be able to use laws, regulations, standards, plans, and policies as tools in planning a safe response to a hazardous materials incident.

This chapter's enabling learning objectives are to ensure participants will have the capability to:

1. Describe the regulatory background for protecting worker health and safety.
2. Define statutory law and case law.
3. Explain the role that regulations and codes play in ensuring safe responses to hazardous incidents.

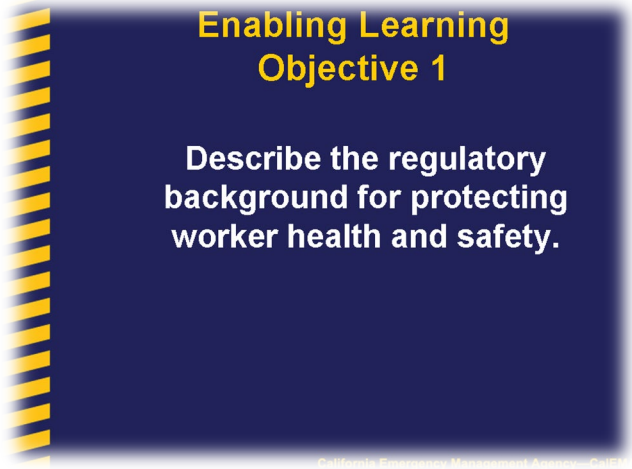
California Specialized Training Institute, 2019



Slide 3.3

This chapter's enabling objectives will also ensure participants have the capability to:

4. Describe the process for developing consensus standards and performance standards.
5. Summarize the interrelationships among policies, plans, standard operating procedures (SOPs), and checklists.



Slide 3.4

The Assistant Safety Officer-Hazardous Materials (ASO-HazMat) is responsible for overseeing all safety aspects of an incident involving hazardous materials, including responder safety.

To do so, the ASO-HazMat must be able to evaluate all inherent hazards and minimize them through risk management, sound judgment, and decisive actions. The ASO-HazMat must also have operational experience. But an ASO-HazMat must also possess a solid grasp of the laws, regulations, and standards that apply to both emergency and non-emergency hazardous materials operations.

This presentation will introduce some of the laws, standards, and regulations the ASO-HazMat must be knowledgeable about.

California Specialized Training Institute, 2019



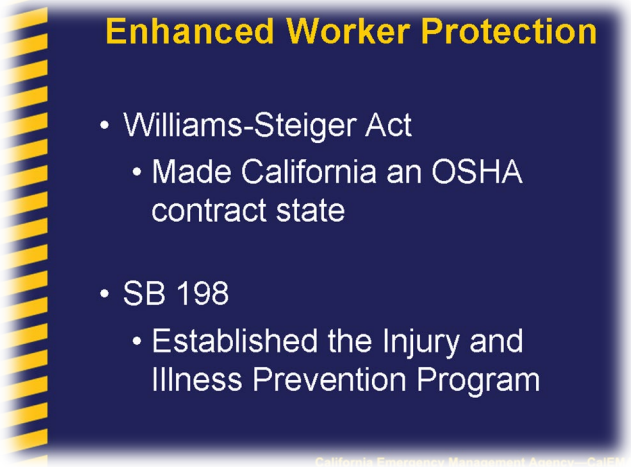
Slide 3.5

Workplace injuries and deaths used to be fairly common. To address this, Congress passed the Occupational Safety and Health (OSH) Act of 1970 (Public Law 91-596). The purpose of this law is to prevent injuries and protect the health of America's workers by assuring safe and healthful workplaces.

Among other provisions, this legislation:

- Set standards for occupational health and safety
- Authorized enforcement of the standards developed under the act
- Offered assistance and encouragement to states in their efforts to assure safe and healthful working conditions
- Provided research, information, education, and training in the field of occupational safety and health

Congress recognized that it could not identify and develop regulations for every workplace hazard. As a result, a "General Duty Clause" was incorporated into the act. This clause required that employers provide "employment and a place of employment which are free from recognized hazards that are causing, or are likely to cause, death or serious physical harm" to workers.



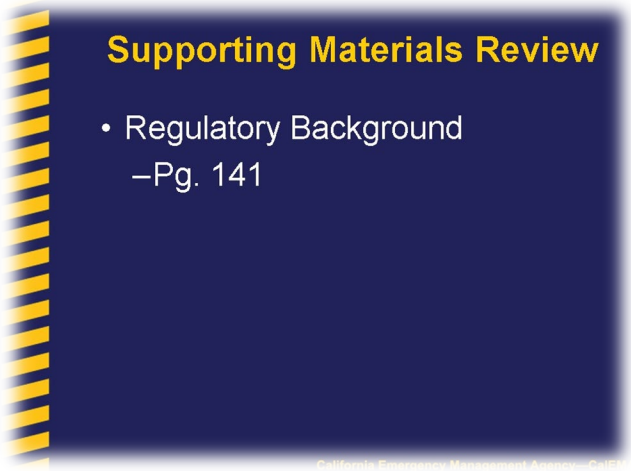
Slide 3.6

The Williams-Steiger Act of 1973 made California an "OSHA contract state." This means that California can be more restrictive than the federal government in establishing workplace regulations.

SB 198, enacted in 1990, describes the employer's responsibilities in establishing, implementing, and maintaining an Injury and Illness Prevention Program.

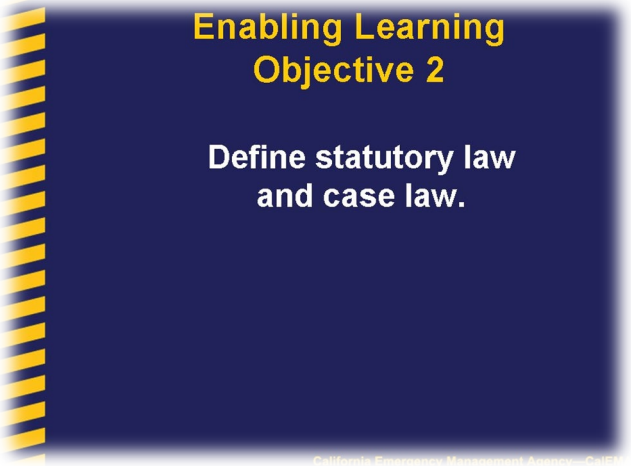
This law also outlines steps that can be taken to develop an effective program that helps assure the safety and health of employees while on the job.

California Specialized Training Institute, 2019

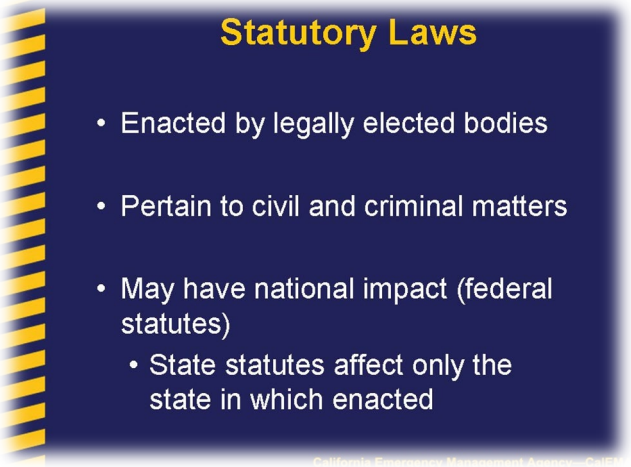


Slide 3.7

Review the listed supporting materials in the participant guide, page 141. This information provides more detail on the federal OSH Act and Title 8, Section 3203 of the California Code of Regulations, which established the Injury and Illness Prevention Program.



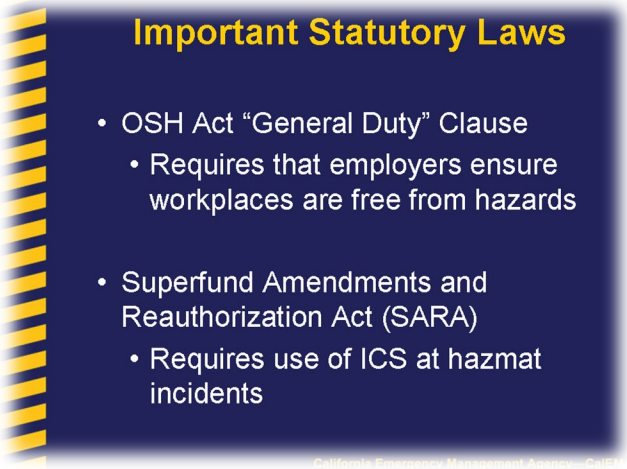
Slide 3.8



Slide 3.9

Statutory laws are enacted by legally elected bodies. They pertain to civil and criminal matters. They are usually enacted within one year, but due to the nature of these laws, they may not have an effect for many years. A federal statute has national impact, whereas a state statute affects only the state in which it was enacted.

California Specialized Training Institute, 2019

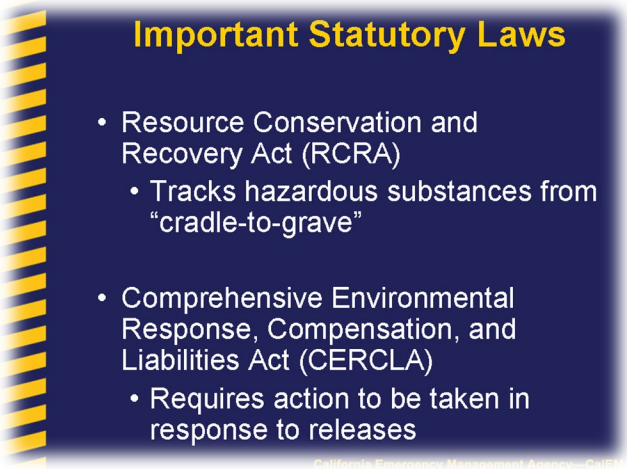


Slide 3.10

The next three slides introduce some of the statutes an ASO-HazMat should be knowledgeable about. These laws and other federal statutes are discussed in greater detail in the "Hazardous Materials Technician 1C" course, and are presented here to provide examples of governing federal laws.

As mentioned earlier, Congress incorporated the "General Duty Clause" into the OSH Act. This clause plays an important role in consensus standards, such as those found in National Fire Protection Association codes.

The Superfund Amendments and Reauthorization Act, also known as SARA, details requirements for an emergency response plan, training, medical surveillance, use of the Incident Command System, operating procedures, and the buddy system.



Slide 3.11

The Resource Conservation and Recovery Act is enforced at the state level and provides for the control of hazardous wastes, their identification and the listing of hazardous wastes, and "cradle-to-grave" documentation.

Comprehensive Environmental Response, Compensation, and Liabilities Act (CERCLA) requires action to be taken in response to releases or threatened releases, requires the responsible party to act, and provides for cost recovery.



Slide 3.12

The Toxic Substance Control Act requires that manufacturers prove that the risks associated with new products are acceptable.

The Federal Insecticide, Fungicide, and Rodenticide Act requires that pesticides and their manufacturing establishments be registered. It also requires classification of pesticides, standards for applicators, and signal words on labels.

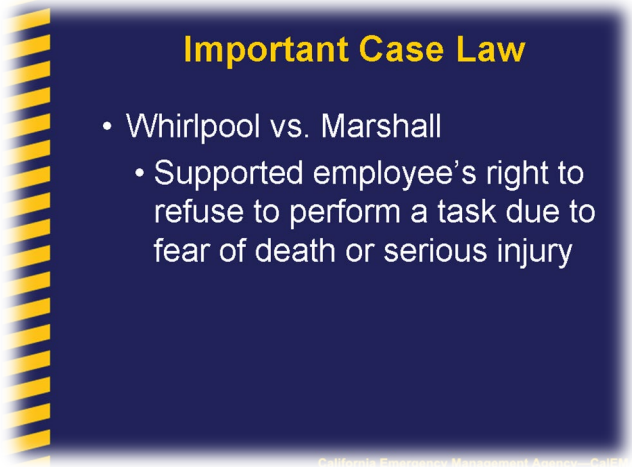
California Specialized Training Institute, 2019



Slide 3.13

Case law is the result of a legal precedent or a judicial decision. These serve as rules for future determinations in similar cases. These decisions affect emergency responders almost immediately, as there usually is no implementation time.

Case law, if heard at the federal level, can have nationwide effect. If a judicial decision is made at the state court level, it affects only that state. Case law is always subject to change.



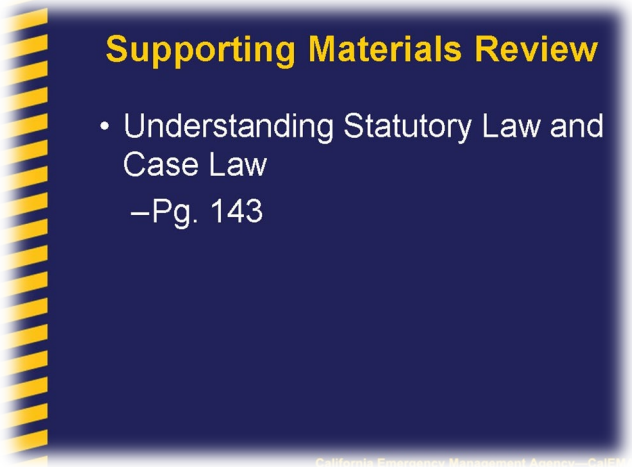
Slide 3.14

Case law decisions can even affect emergency responders when the specific case has nothing to do with emergency response personnel. An example of this is Whirlpool Corporation vs. Marshall. In this case, the Supreme Court found in favor of an employee's right to choose not to perform an assigned task because of a reasonable fear of death or serious injury.

Excerpt from Supreme Court transcript:

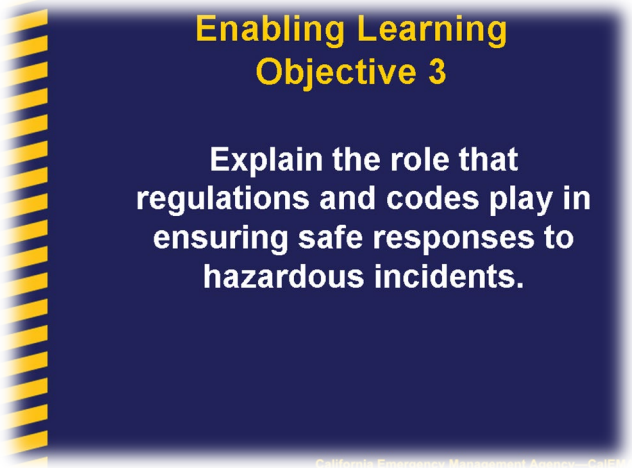
"And this regulation provides that he may not be discriminated against if he refuses to perform a particular assigned task when the following conditions occur: first, in good faith; second, he concludes that there is a real danger of death or serious injury confronting him; three, under circumstances that a reasonable person would so conclude; four, and the urgency of the situation afforded insufficient time to eliminate the danger through resort to the regular statutory enforcement channels; five, he also sought if possible from his employer, but without success, a correction of the dangerous condition; and six, he had no reasonable alternative."

California Specialized Training Institute, 2019



Slide 3.15

Review the listed supporting materials in the participant guide, page 143. This information provides more detail on statutory law and case law, and includes an excerpt from the Supreme Court transcript in Whirlpool Corporation vs. Marshall.



Slide 3.16

California Specialized Training Institute, 2019



Slide 3.17

Regulations are the result of an act passed by Congress. An act describes what our national legislature desires as an end result.

Once an act is signed by the president, a governmental body (bureaucracy) is created or assigned to carry out the legislation. These agencies develop and issue mandatory requirements, the regulations or rules (methods) by which the act will be accomplished. These regulations have the same impact and authority as statutory law.

OSHA is one federal agency that issues such rules and regulations. The Environmental Protection Agency, EPA, is another.

OSHA regulations were initially taken from three sources: consensus standards, proprietary standards, and federal laws in effect at the time the OSH Act became law.

(Consensus standards and proprietary standards will be discussed later in this presentation.)



Slide 3.18

Codes are a compilation of rules or regulations (and standards) pertaining to the same subject and arranged systematically for easy reference and use.

California has some of the most comprehensive laws, regulations, and codes in the nation to protect the health and safety of workers. The California Code of Regulations and the California Health and Safety Code contain many requirements that hazardous materials responders must follow.

The Code of Federal Regulations, the CFR, is another important resource. It codifies both general and permanent rules published by the executive departments and agencies of the federal government.

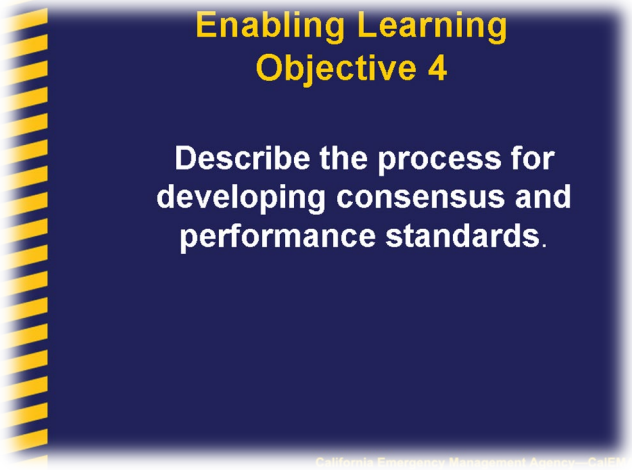
California Specialized Training Institute, 2019



Slide 3.19

Review the listed supporting materials in the participant guide, page 145. This information identifies several state codes the ASO-HazMat should be familiar with. In addition, it explains how the numbering system for the Code of Federal Regulations works.

Review the contents of Appendix B on page 451. It is important for an ASO-HazMat to be familiar with these regulations.



Slide 3.20

Standards are sometimes referred to as being either vertical or horizontal in their application. Most standards are horizontal, or general, which means they apply to any employer in any industry. In contrast, a vertical standard applies only to a particular industry for which it was designed.

California Specialized Training Institute, 2019



Slide 3.21

Consensus standards are developed by a standards-making organization within a specific industry. These organizations are made up of a cross-section of industry experts and representatives. These organizations reach substantial agreement upon issues through open discussion.

Substantial agreement signifies that, in general, an industry's hazards have been identified and practices to mitigate those hazards have been recommended.

Consensus standards can be used in litigation against other agencies. The National Fire Protection Association (NFPA) and the American National Standards Institute (ANSI) are two examples of organizations that develop consensus standards.

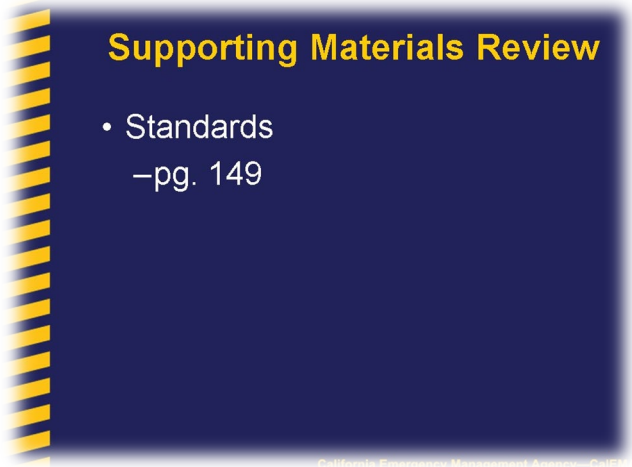
Generally, consensus standards are horizontal standards.



Slide 3.22

Performance standards are developed by professional societies and associations and by experts within specific industries. These standards result from a straight majority vote of the membership and not by reaching substantial agreement.

Generally, performance standards are vertical standards.

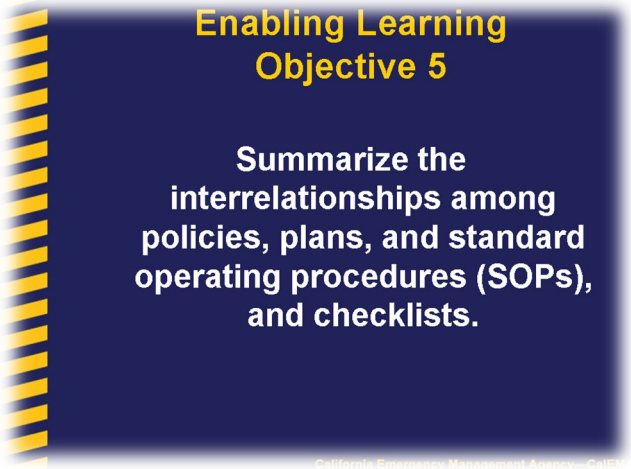


Slide 3.23

Review the listed supporting materials in the participant guide, page 149. This section provides more detail on three National Fire Protections Association standards all ASO-HazMats should be familiar with:

- NFPA 471: Recommended Practice for Responding to Hazardous Materials Incidents
- NFPA 472: Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents
- NFPA 1500: Fire Department Occupational Safety and Health Program

California Specialized Training Institute, 2019



Slide 3.24



Slide 3.25

It is a legal requirement to have a Safety Officer at every incident involving hazardous materials. Along with this requirement, each department must have written response procedures to ensure that personnel have the necessary direction and training to successfully mitigate incidents involving hazardous materials. Safety must be a part of every action that a hazardous materials team undertakes, from the training to the actual response—and everything in between.



Slide 3.26

Policies reflect an agency's plans and objectives and are sharply distinguished from them. Policies set desires, guidance, and direction from the leadership.

Policy directives are developed as a result of either legislative action, adoption of consensus standards, organizational culture, or the influence of corporate knowledge on operational processes.

Policy affects either administrative standards or operational requirements.

California Specialized Training Institute, 2019



Slide 3.27

A plan details how a policy is to be implemented and when a function is to be provided.

For example, a department might establish a policy for responding to hazardous materials incidents. To meet the department's policy, personnel will need to develop a "Hazardous Materials Incident Contingency Plan."



Slide 3.28

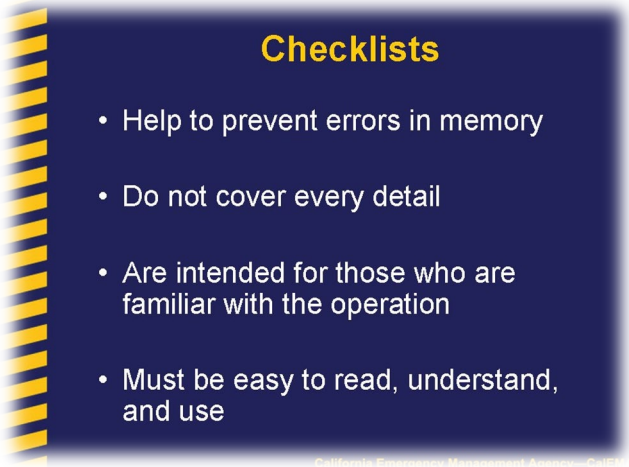
Standard Operating Procedures, SOPs, are written documents that departments develop to provide detailed action statements and to specify duties performed by staff.

These procedures affect only the department that writes them and may or may not affect other divisions within a department. SOPs must be based on law and meet or exceed those requirements. SOPs tend to be restrictive.

The current trend is to develop Standard Operational Guidelines, or SOGs. SOGs are less restrictive than SOPs and allow for greater flexibility in the application of organizational requirements in the judgment of the responding individual.

Think of SOGs as "goal posts." As long as individuals act within the parameters, they have met compliance.

California Specialized Training Institute, 2019

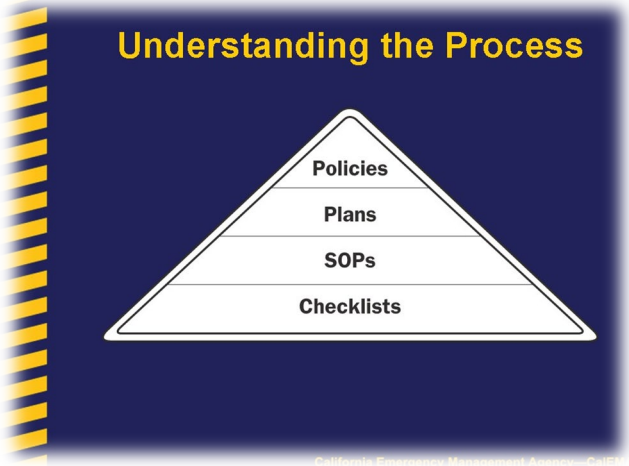


Slide 3.29

Checklists are designed to protect memory.

Checklists are short, concise (usually bulleted) "cheat sheets" that summarize the important elements of a task.

They are designed for ready reference and use.

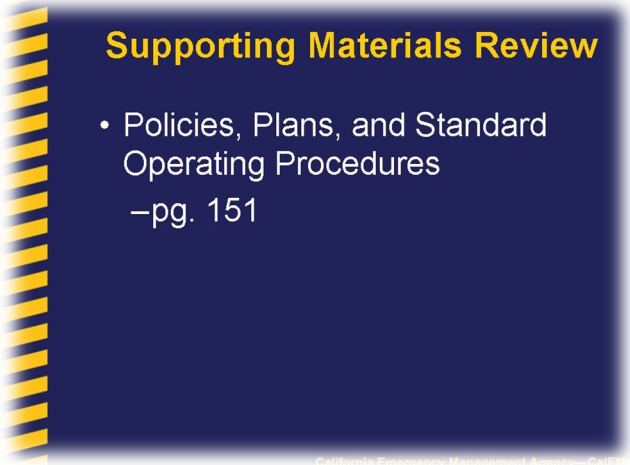


Slide 3.30

These documents are interrelated.

- Policies set desires, guidance, and direction from the leadership.
- Plans detail who, when, and how policies are implemented.
- SOPs provide detailed action statements and describe duties.
- Checklists protect memory.

It is very important for the ASO-HazMat to have a thorough understanding of how standards, rules, regulations, policies, plans, and checklists are developed and used.



Slide 3.31

Review the listed supporting materials in the participant guide, page 151. This information includes an example of a checklist for Level "A" protective clothing.

California Specialized Training Institute, 2019



Slide 3.32

California Specialized Training Institute, 2019

Chapter 3



Supporting Materials/ resource List

Regulatory Background

Introduction

The Assistant Safety Officer-Hazardous Materials (ASO-HazMat) is responsible for overseeing all safety aspects, including the safety of responders, of an incident involving hazardous materials. To that end, the ASO-HazMat must be able to evaluate all inherent hazards and minimize them through risk management, sound judgment, and decisive actions. The ASO-HazMat must also have operational experience. In addition, an ASO-HazMat must also possess a solid grasp of the laws, regulations, and standards that apply to both emergency and non-emergency hazardous materials operations. Laws and regulations are essen- tial "tools" that will help the ASO-HazMat safely mitigate emergency incidents and oversee routine daily functions in preparation for emergency incidents.

Protecting Worker Health and Safety

Workplace injuries and deaths used to be fairly common. To address this, Congress passed the Occupational Safety and Health (OSH) Act of 1970, which was signed into law by President Nixon (Public Law 91-596). The purpose of this legislation was to prevent injuries and protect the health of America's workers by assuring safe and healthful workplaces.

Among other provisions, this legislation:

- Set standards for occupational health and safety
- Authorized enforcement of the standards developed under the act
- Offered assistance and encouragement to states in their efforts to assure safe and healthful working conditions
- Provided research, information, education, and training in the field of occupational safety and health

Congress recognized that it could not identify and develop regulations for every workplace hazard. As a result, a "General Duty Clause" was incorporated into the act. This clause required that employers provide "employment and a place of employment which are free from recognized hazards that are causing, or are likely to cause, death or serious physical harm" to workers. This clause plays an important role in consensus standards, such as those found in National Fire Protection Association codes. (Consensus standards will be discussed in greater detail later in this chapter.)

California Laws Strengthen the OSH Act

In 1973, California passed the Williams-Steiger Act, making California an "OSHA contract state." This means that California can develop its own industry safety orders that are, at a minimum, as effective and encompassing as federal standards. The Williams-Steiger Act also required that any new national regulations be incorporated into the state's regulations no later than six months after federal enactment.

California Specialized Training Institute, 2019

California went even further. In 1990, the state enacted legislation that required employers to establish, implement, and maintain an effective Injury and Illness Prevention Program [Senate Bill 198, California Code of Regulations (CCR), Title 8, Section 3203]. In general, these programs must include:

- A system for ensuring that employees comply with safe and healthy work practices
- A system for providing information on occupational safety and health matters that all affected employees could easily understand
- Procedures for identifying and evaluating workplace hazards
- A procedure to investigate occupational injury or occupational illness
- Methods and/or procedures for correcting unsafe or unhealthy conditions, work practices, and work procedures
- Training and instruction
- Written records on steps taken to implement and maintain the program

California has some of the most comprehensive laws and regulations in the nation when it comes to protecting worker health and safety.

California Specialized Training Institute, 2019

understanding Statutory and Case Law

This section discusses two general types of laws: statutory law and case law.

Statutory Law

Statutory laws are those that are enacted by legally elected bodies. They pertain to civil and criminal matters. Due to the nature of these laws, their effect may not be felt for many years. A state statute affects only the state in which it was enacted. In contrast, a federal statute has national impact and must be applied in every state.

For example, the "Ryan White Comprehensive AIDS Resource Emergency Act" and the "American with Disabilities Act" are federal statutes that have implications for emergency responders. Other federal statutes that an ASO-HazMat should be aware of and that affect hazardous materials responders include:

- Superfund Amendments and Reauthorization Act

  Provisions of this law detail requirements for an emergency response plan, training, medical surveillance, operating procedures, and the buddy system.

- Resource Conservation and Recovery Act

  This law is enforced at the state level and governs the identification, management, and disposal of solid and hazardous wastes. One provision of this law, known as the "cradle-to-grave" program, tracks the progress of hazardous substances from their generation, to their treatment, their transport, and their disposal.

- Toxic Substance Control Act

  This law requires that manufacturers prove that the risks associated with new products are acceptable.

- Comprehensive Environmental Response, Compensation, and Liabilities Act

  This law requires that action be taken in response to releases, or threatened releases, of hazardous substances. It also requires the responsible party to act and provides for cost recovery.

- Federal Insecticide, Fungicide, and Rodenticide Act

  This law requires that pesticides and their manufacturing establishments be registered. It also requires classification of pesticides, standards for applicators, and signal words on labels.

Case Law

Case law is the result of a legal precedent and judicial decisions. Case laws serve as rules for future determinations in similar cases. Case law, if heard at a federal level, can have nationwide effect. If heard at the state level, such decisions affect only that state. Case law is always subject to change.

Case law decisions usually do not require implementation time. As a result, they can affect emergency responders almost immediately. Case law decisions can even affect emergency responders when the specific case has nothing to do with emergency response personnel. An example of this is Whirlpool Corporation

California Specialized Training Institute, 2019

vs. Marshall. This case found in favor of an employee's right to choose not to perform an assigned task because of a reasonable fear of death or serious injury.

Excerpt from the Supreme Court Transcript "Whirlpool Corporation vs. Marshall"

"And this regulation provides that he may not be discriminated against if he refuses to perform a particular assigned task when the following conditions occur: first, in good faith; second, he concludes that there is a real danger of death or serious injury confronting him; three, under circumstances that a reasonable person would so conclude; four, and the urgency of the situation afforded insufficient time to eliminate the danger through resort to the regular statutory enforcement channels; five, he also sought if possible from his employer, but without success, a correction of the dangerous condition; and six, he had no reasonable alternative."

These laws and other federal statutes are discussed in greater detail in the Hazardous Materials Technician 1C course.

California Specialized Training Institute, 2019

rules, regulations, and Codes

Regulations are the result of an act passed by Congress. An act describes what our national legislature desires as an end result. Once an act is signed by the president, a governmental body (bureaucracy) is created or assigned to carry out the legislation. These agencies develop and issue mandatory requirements, the regulations or rules (methods), by which the act will be accomplished. These regulations have the same impact and authority as statutory law.

The Environmental Protection Agency is one federal agency that issues such rules and regulations. The Occupational Safety and Health Administration (OSHA) is another. OSHA regulations were initially taken from three sources: consensus standards, proprietary standards, and federal laws in effect at the time the OSH Act became law.

All regulations, rules, case law, and standards are developed with responder safety in mind. By following these requirements, liability to the responder and the responding agency is more easily managed.

Codes

Codes are a compilation of rules or regulations (and standards) pertaining to the same subject and arranged systematically for easy reference and use.

California Code of Regulations

The California Code of Regulations (CCR) contains many requirements that hazardous materials responders must follow. Several titles of the CCR have direct impact on responders. These are:

- CCR Title 8 – Section 5192 (General Industry Safety Orders)
  This workplace standard requires use of the ICS system, a safety official, and minimum training requirements for hazardous materials response.
- CCR Title 19 – Sections 2510 – 2560
  These regulations standardize training for hazardous materials emergency response.
- CCR Title 22 – Hazardous Waste Control
  This provision defines waste, hazardous waste, and extremely hazardous waste.

Health and Safety Code

The California Health and Safety Code provides additional legal requirements that pertain to the Safety Officer and Assistant Safety Officer-Hazardous Materials (ASO-HazMat). The Health and Safety Code is divided into chapters. The chapters that have direct influence on hazardous materials requirements include:

- Chapter 6.6: Safe Drinking Water and Toxics Enforcement Act
- Chapter 6.7: Underground Storage Tanks

California Specialized Training Institute, 2019

- Chapter 6.8: Hazardous Substance Account
- Chapter 6.95: Hazardous Materials Disclosure Act

These laws and other state statutes are discussed in greater detail in the Hazardous Materials Technician IC course, and are presented here to provide examples of governing state laws.

Code of Federal Regulations (CFR)

The Code of Federal Regulations (CFR) is another important resource that the ASO-HazMat must be familiar with and able to use properly. The CFR codifies both general and permanent rules published by the executive departments and agencies of the federal government. Every year the CFR is updated on July 1. Revisions to the CFR also appear in the *Federal Register*, which is published daily. Both the CFR and the *Federal Register* must be used together to determine the most current version of a rule.

The CFR is divided into 50 titles representing broad areas that are subject to federal regulation. Each title is divided into chapters, usually bearing the name of the issuing agency. Each chapter is further divided into subparts covering specific regulatory areas. For example, the Occupational Safety and Health Act is designated as Title 29 – Labor, Chapter XVII, Titles 28 – 41.

CFR Numbering System

The CFR codification system arranges information on regulations into discrete and specific blocks of information, using letters, numbers, and Roman numerals to identify this information.

Continuing with the example of the Occupational Safety and Health Act, Title 29, Chapter XVII is broken into parts. Part 1910, for instance, is the reference for Occupational Safety and Health Standards. Parts are also broken down into major blocks of information known as subparts. For example, Part 1910, Subpart H deals with hazardous materials and Part 1910, Subpart Z addresses requirements for toxic and hazardous substances. Not surprisingly, each subpart is further divided; in this case, into sections. Part 1910, Subpart H, Section 120 identifies standards for hazardous waste operations and emergency response, commonly referred to as "HAZWOPER."

If you were to look up information in the CFR on hazardous waste operations (HAZWOPER) described in the previous paragraph, the citation would appear as:

Title	Code of Fed Reg	Part	Section
29	CFR	1910	.120

The first tier of paragraphs beneath the section level will be a lowercase alpha letter in parentheses. If there were only four major paragraphs of information under a section, they would appear as 120(a), 120(b), 120(c) and 120(d). For example:

Title	Code of Fed REG	Part	Section
29	CFR	1910	.120 (b)

California Specialized Training Institute, 2019

The next level of numbering uses Arabic numbers. If there were four paragraphs between subheadings (a) and (b), they would appear as (a) (1), (a) (2), (a) (3) and (a) (4). For example:

Title	Code of Fed Reg	Part	Section
29	CFR	910	.120 (b) (8)

The next level uses the lowercase Roman numeral. If there were three paragraphs of information pertaining to Arabic (8), they would be identified as (8) (i), (8) (ii) and (8) (iii). For example:

Title	Code of Fed Reg	Part	Section
29	CFR	1910	.120 (b) (8) (iii)

The numbering system simply repeats itself on the other side of the last lowercase Roman numeral. However, the numbering system is italicized. For example:

Title	Code of Fed Reg	Part	Section
29	CFR	1910	.120 (b) (8) (iii) *(b) (a) (ii)*

The important concept to understand is the basic numbering system from the section level. The first digit will always be a lowercase alpha letter, the second digit will always be an Arabic number, and the third digit will always be a lowercase Roman numeral.

California Specialized Training Institute, 2019

Standards

Standards are sometimes referred to as being either vertical or horizontal in their application. Most standards are horizontal, or general, which means they apply to any employer in any industry. In contrast, a vertical standard applies only to a particular industry for which it was designed.

Consensus Standards

Generally, consensus standards are horizontal standards. Consensus standards are developed by a standards-making organization within a specific industry. These organizations are made up of a cross-section of industry experts and representatives. These organizations reach substantial agreement upon issues through open discussion. Substantial agreement signifies that, in general, an industry's hazards have been identified and practices to mitigate those hazards have been recommended. The National Fire Protection Association (NFPA) and the American National Standards Institute (ANSI) are two examples of organizations that develop consensus standards.

As mentioned earlier, many consensus standards, including those of the NFPA and ANSI, are incorporated into OSHA's regulations. This is because consensus standards effectively become industry-recognized national standards of care. Similarly, under the General Duty Clause of the federal OSH Act, employers have been required to adhere to criteria established by consensus-developing bodies. Examples of consensus standards that affect hazardous material response teams are NFPA standards 471, 472, and 1500.

- NFPA 471: Recommended Practice for Responding to Hazardous Materials Incidents

  This standard recommends standard operating guidelines for responding to hazardous materials incidents. It specifically covers planning procedures, establishing policies, and applying procedures to incidents; personal protective equipment; decontamination; safety; and communications.

- NFPA 472: Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents

  This standard identifies the minimum levels of competence required by responders to emergencies involving hazardous materials/weapons of mass destruction (WMD). This standard is based on the operational philosophies that emergency responders should be trained to perform their expected tasks, and that a responder cannot safely and effectively respond to a terrorism or criminal scenario involving hazmats/WMD if they don't first understand basic hazardous materials response.

- NFPA 1500: Fire Department Occupational Safety and Health Program

  This standard provides the protocols required for everything from fire fighter training, vehicles, and tools to emergency operations, incident stress, and protective clothing and equipment.

Performance Standards

Generally, performance standards are vertical standards. Performance standards are developed by professional societies and associations, and by experts within specific industries. These standards result from a straight majority vote of the membership, and not by reaching substantial agreement.

California Specialized Training Institute, 2019

Policies, Plans, and Standard Operating Procedures

Safety must be a part of every action that a hazardous materials team undertakes, from the training to the actual response—and everything in between. That is why policies, plans, procedures, and other guidelines are so important. Each department must have written response procedures to ensure that personnel have the necessary direction and training to successfully mitigate incidents involving hazardous materials.

Policies and Plans

Organizations are driven by policy. Policies reflect an agency's plans and objectives and are sharply distinguished from them. Policies set desires, guidance, and direction from the leadership.Policy directives are developed as a result of either legislative action, adoption of consensus standards, organizational culture, or the influence of corporate knowledge on operational processes. Policy either affects administrative standards or operational requirements, both of which apply to a hazardous materials response team.

A plan details how a policy is to be implemented and when a function is to be provided. For example, a department might establish a policy for responding to hazardous materials incidents. To meet the department's policy, personnel will need to develop a "Hazardous Materials Incident Contingency Plan."

Standard Operating Procedures

Standard Operating Procedures (SOPs) are written documents developed by a department. SOPs provide detailed action statements and duties for activities performed by members of the department. These procedures affect only the department that writes them, and may or may not affect other divisions within a department. The requirements for these SOPs must be based on law and meet or exceed those requirements. For example, a response agency cannot have a SOP that directs members to operate in an exclusion zone, in Level A or B Chemical Protective Clothing, without a backup team.

SOPs tend to be restrictive and do not allow flexibility in the application of organization rules and regulations. In the event of a civil lawsuit, it is less difficult to prove violation of an SOP. An example of an SOP would be to require that the ASO-HazMat develop and use an operational checklist at emergency incidents and to communicate with the Incident Safety Officer to address overall incident safety.

Standard Operational Guidelines and Checklists

The current trend is to develop Standard Operational Guidelines. SOGs are less restrictive than SOPs. SOGs also allow the responding individual greater flexibility and judgment in applying organizational requirements. Think of SOGs as "goal posts." As long as individual responders act within the parameters of the SOG, they have met compliance.

Checklists are designed to protect memory. Checklists are short, concise (usually bulleted) "cheat sheets" that summarize the important elements of a task. They are designed for ready reference and use. An example of a checklist for wearing Level "A" protective clothing follows:

California Specialized Training Institute, 2019

Hazardous Incident Response Level "A" Protective Clothing Checklist

Incident Name: _____			**Incident No:**	**Date:**
	Team Member, Number, and Name			
Task Assigned	**#1**	**#2**	**#3**	**#4**
Personal Items Off, Greens On				
Nomex Jumpsuit (Opt)				
Saranex Inner Chemical Suit				
SCBA & Radio (Don & Check)				
Record Pressure: Suit Time Log				
Inner Gloves				
Legs in Suit				
Outer Boots & Boot Covers				
Color Code & Log: Suit Time Log				
(PVC) Suit Gloves & Cuffs in Arms				
Arms in Suit				
(CPE & TREL) Suit Gloves & Rings				
Work Gloves				
Final Briefing, Equipment Ready				
SCBA Air Tube Hookup & Check				
Log Time on Air: Suit Time Log				
Complete Suiting, Zip, and Seal				
Entry Team Leader/Decon Team Leader Signature: _____				

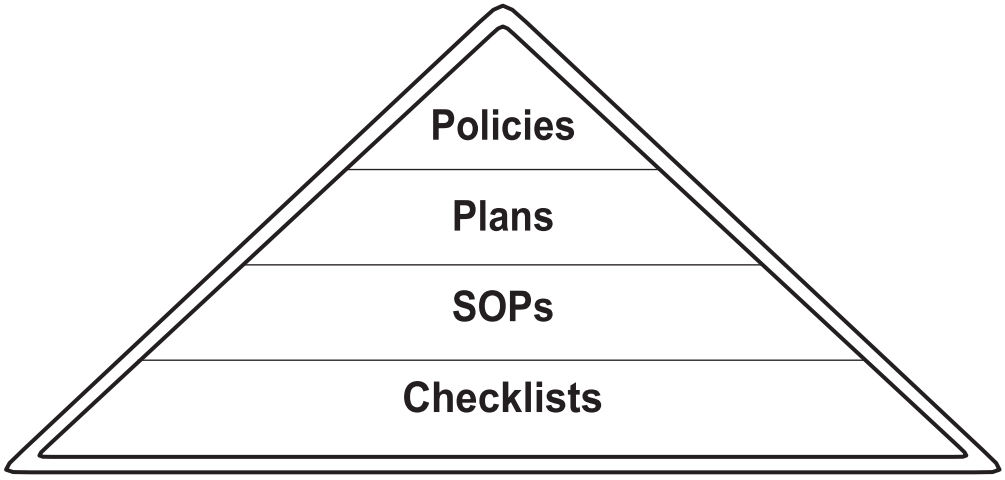
California Specialized Training Institute, 2019

understanding the Process

Here is a simple way to think of the interrelationships among policies, plans, standard operating procedures, and checklists:

- Policies set desires, guidance, and direction from the leadership.
- Plans detail who, when, and how policies are implemented.
- SOPs provide detailed action statements and describe duties.
- Checklists protect memory.

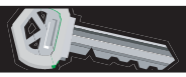
This interrelationship is illustrated in the graphic that follows:



It is very important for the ASO-HazMat to have a thorough understanding of how standards, rules, regulations, policies, plans, and checklists are developed and used.

California Specialized Training Institute, 2019

Chapter 3



Practical Exercises

Practical Exercises 3.1: developing Checklists

Directions: Read the scenario to yourself. Working together in a small group, develop the checklist asked for in the scenario. Be prepared to share your group's checklist with the entire class.

1. You have just been given additional duties as the ASO-HazMat for your team. One of your new assignments is to develop a safety checklist for hazardous materials responses.

California Specialized Training Institute, 2019

Safety Checklist for Hazardous Materials response

Initial Actions

- ☐ Assume Command and Establish ICS
- ☐ Assign Safety Officer
- ☐ Identify Local Source of Information
- ☐ Establish Perimeter—ERG Initial
- ☐ Assess Release Size and Direction of Travel
- ☐ Determine Protective Actions
- ☐ Make Notifications—911/OES/NRC
- ☐ Identify Responsible Party
- ☐ Designate Spotter or Forward Observer

ICS Assignments

- ☐ Deputy IC
- ☐ Safety Officer ASO
- ☐ Site Access Control
- ☐ Entry Leader
- ☐ Operations Chief
- ☐ Decon Leader
- ☐ HazMat Group Sup
- ☐ Technical Reference
- ☐ Liaison Medical Unit

ICS Considerations

- ☐ Staging Area Manager
- ☐ Evacuation Unit
- ☐ Technical Reference
- ☐ Complete Description of Site and Release
- ☐ Site Evacuations and Site Security
- ☐ Report Safe Site Approach—Incoming Units
- ☐ Stage Incoming Units
- ☐ Resource Assessment
- ☐ Multiple Incidents—Triage
- ☐ Establish Communications Network
- ☐ Accidental/Intentional (secondary device)

Safety

- ☐ Confirm Perimeter Distances
- ☐ Ensure Monitoring at CP
- ☐ Develop Monitoring and Sampling Plan
- ☐ Confirm Adequacy of PPE/Compatibility
- ☐ Prepare Safety Briefing
- ☐ Develop Site Safety Plan
- ☐ Review Incident Action Plan
- ☐ Conduct Hazard and Risk Assessment
- ☐ Designate Safety Zone
- ☐ Identify Emergency Egress/Decon
- ☐ Confirm Emergency Evacuation Signal
- ☐ Identify Emergency Evacuation Meeting Location
- ☐ Ensure Equipment Checks
- ☐ Develop Injury and Rescue Plan

California Specialized Training Institute, 2019

Operational risk Management



Scope

This chapter provides an overview of risk management and describes Operational Risk Management, which is both a tool and a process for minimizing risk and maximizing the health and safety of responders. This chapter also introduces techniques for forecasting risk in a pre-emptive, rather than reactionary, fashion.



Terminal Learning Objective (TLO)

At the end of instruction of Chapter 4, participants will be able to identify, inventory, and analyze the hazards and risks involved in an incident, and take appropriate action, either through direct intervention or by contacting the responsible supervisor with recommendations for minimizing risk.



Enabling Learning Objectives (ELOs)

This chapter's enabling learning objectives are to ensure that participants will be able to:

1. Explain why risk management is an essential tool for the Assistant Safety Officer-Hazardous Materials.
2. Describe the six steps for conducting Operational Risk Management.
3. Describe the role of the Assistant Safety Officer-Hazardous Materials as a risk manager.
4. Apply forecasting tools, rapid intervention crews, EMS support, and psychological support in protecting responder health and safety.
5. Summarize the process for conducting investigations that involve emergency response personnel.

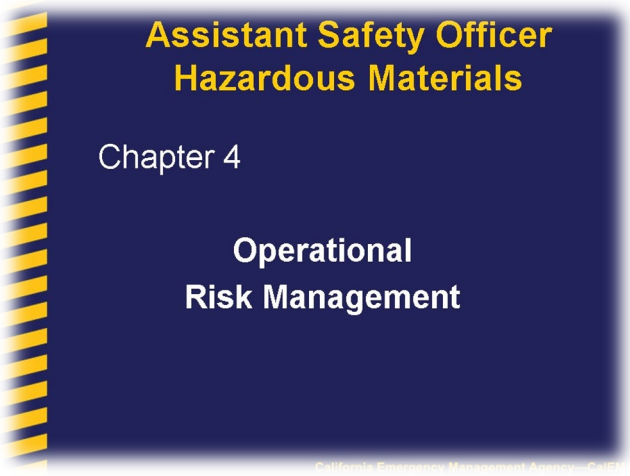
Supporting Materials/resource List

See Supporting Materials/Resource List section starting on page 183.

California Specialized Training Institute, 2019

Practical Exercises

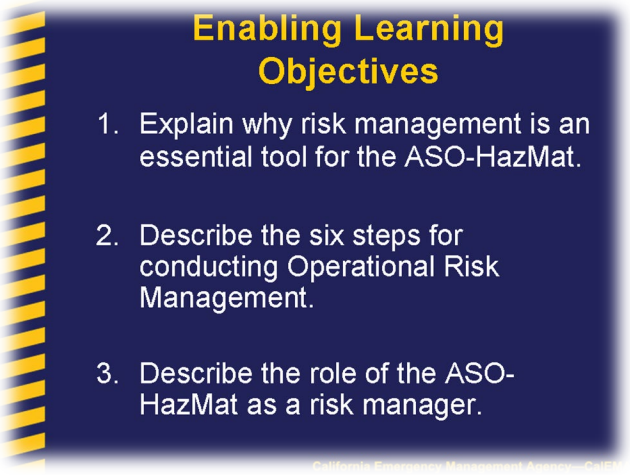
Note: No exercises are scheduled for this chapter.



Slide 4.1

The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

- (Res.B.1 16.1) Ensure coordination of assets assigned to perform worker safety and health risk assessment and risk management.
- (Res.B.2 5.1.4.1) Develop and implement a site-specific safety and health plan that includes worker risk assessment and risk management.



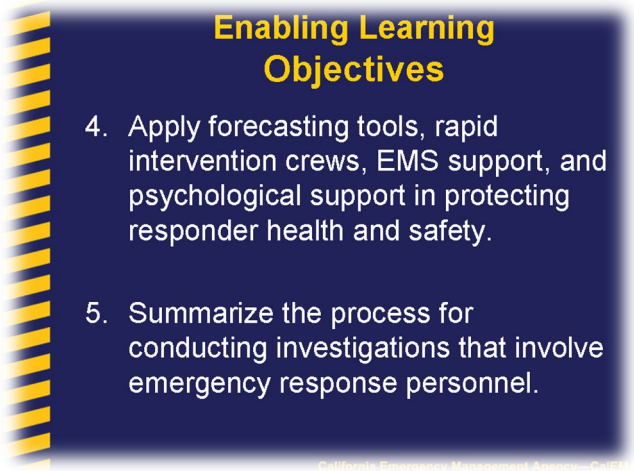
Slide 4.2

The goal (terminal learning objective) of this chapter is to ensure that participants will be able to identify, inventory, and analyze the hazards and risks involved in an incident, and take appropriate action, either through direct intervention or by contacting the responsible supervisor with recommendations for minimizing risk.

This chapter's enabling learning objectives are to ensure participants will have the capability to:

1. Explain why risk management is an essential tool for the Assistant Safety Officer-Hazardous Materials.
2. Describe the six steps for conducting Operational Risk Management.
3. Describe the role of the Assistant Safety Officer-Hazardous Materials as a risk manager.

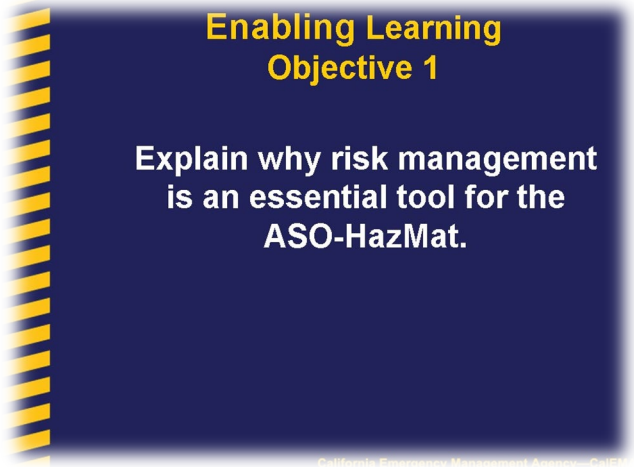
California Specialized Training Institute, 2019



Slide 4.3

This chapter's enabling learning objectives will also ensure participants have the capability to:

4. Apply forecasting tools, rapid intervention crews, EMS support, and psychological support in protecting responder health and safety.
5. Summarize the process for conducting investigations that involve emergency response personnel.



Slide 4.4



Slide 4.5

Risk is a part of everyday life. We accept it either consciously or subconsciously with every decision we make. Every action we take carries with it the chance we might be killed or injured. Risk is inescapable: it affects us as we work and as we play. No activity is totally without risk.

Risks are as varied as the activities we engage in and the surroundings in which these activities take place. For our purposes, risk can be classified into five general forms:

California Specialized Training Institute, 2019

- Mechanical—such as machinery, noise, collapsing/falling objects, falls, energy sources (thermal and electrical), etc.
- Environmental—such as noise, weather (rain, hail, wind, etc.), thermal (heat and cold), energy (lightning), etc.
- Chemical—such as energy (radiation, thermal, explosion, etc.), corrosion, reactivity, etc.
- Physiological—such as injury from inhalation, injection, ingestion, absorption, abrasion, blunt trauma, etc.
- Psychological—such as anxiety, apprehension, claustrophobia, etc.



Slide 4.6

Risk management is pre-emptive, rather than reactive. The approach is based on the philosophy that it is irresponsible and wasteful to wait until an accident is imminent before taking action to prevent it.

Risk management is a process of tradeoffs. For example, statistics often show that driving to the incident is the activity that causes the most deaths among firefighters while in the line of duty. Yet firefighters respond quickly to an emergency call and take the risk of being in a traffic accident. The tradeoff for taking this risk is saving the lives of others. We make these kinds of tradeoffs every day. Hazardous materials response is no different.

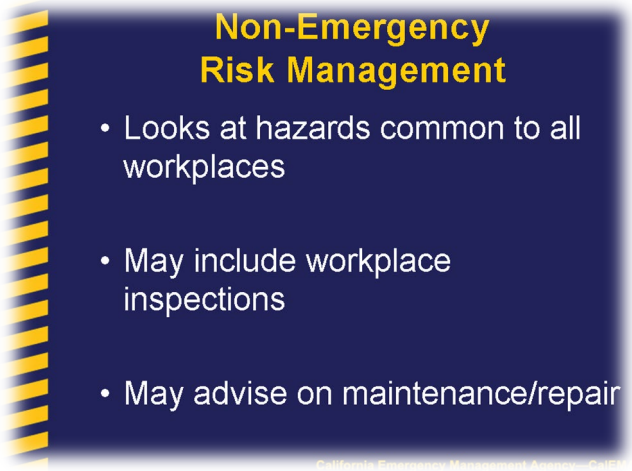
Risk management is a common sense approach to assess a situation, balance the risks against the benefits, and then choose the most effective course of action.

Risk management requires that we manage potential and specific risk in various settings.

Risk management falls into three categories:

- Non-emergency
- Pre-emergency
- Emergency

California Specialized Training Institute, 2019

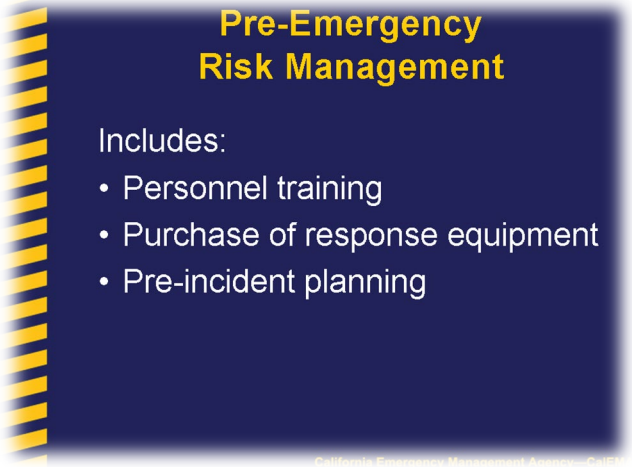


Slide 4.7

Non-emergency risk management looks at the hazards common to all workplaces.

This type of risk management might include inspections of the workplace and management offices of emergency response organizations.

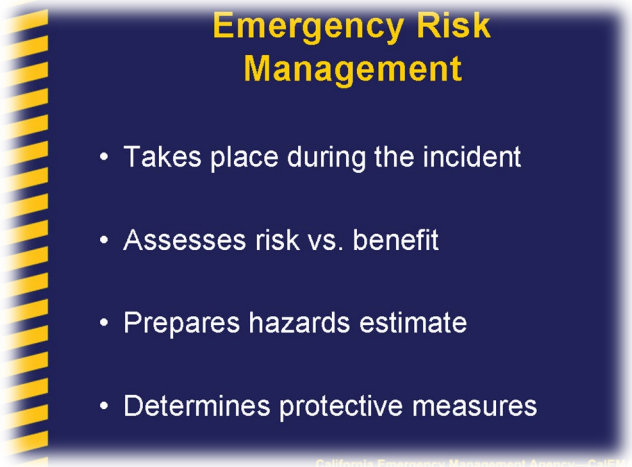
The risks encountered in these places are no less deadly than those encountered at an emergency scene, but their frequency and severity will be significantly less.



Slide 4.8

As the name implies, pre-emergency risk management activities take place before an emergency. This type of risk management looks at the kinds of hazards that *might* happen.

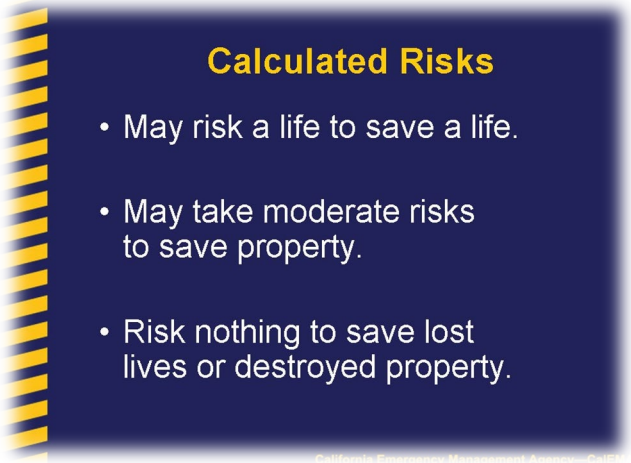
Pre-emergency risk management includes training personnel, purchasing response equipment, and pre-incident planning activities. These activities can have a major impact on the safety of members working at the scene of an emergency.



Slide 4.9

Emergency risk management activities take place during the incident. These activities directly assess the risks and benefits of incident activities for the citizens involved and the responders. Emergency risk management evaluates those activities where the majority of injuries occur—at the emergency.

California Specialized Training Institute, 2019

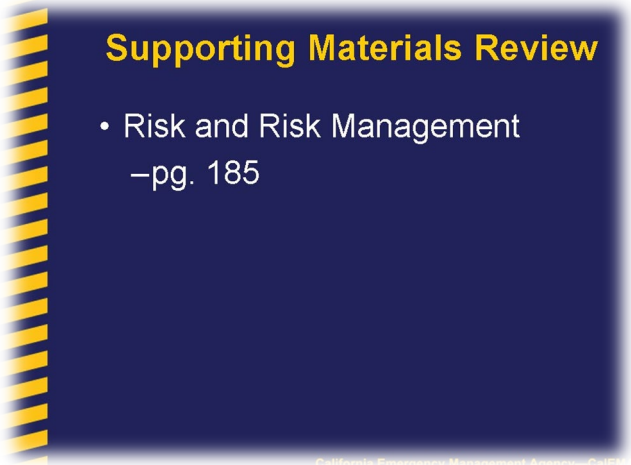


Slide 4.10

We must take calculated risks in this job. It may be acceptable to risk life to save life and to take moderate risk to save property.

Nothing is gained by risking life to recover those who have died or property that is beyond saving.

- Does your agency have a formal standard operating procedure or unspoken agency rule that addresses when someone would risk a life?
- Under what conditions would *you* risk a life to save a life?

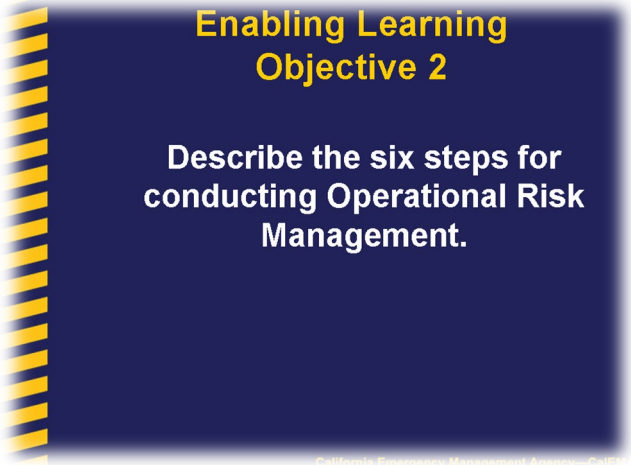


Slide 4.11

Review the listed supporting materials in the participant guide, page 185.

The information in this section also includes questions and guidelines the ASO-HazMat can use to help determine potential loss exposures, page 187.

These questions and guidelines are part of the training course "Fire Command 2B: Management of Major Hazardous Materials Incidents."



Slide 4.12

California Specialized Training Institute, 2019



Slide 4.13

While the three statements in the Calculated Risks slide (4.10) offer an excellent way to approach managing risk in general, the ASO-HazMat also has other tools that provide specific steps to help minimize risk and to maximize efficacy, health, and safety. One such tool is Operational Risk Management (ORM).

ORM is a formal decision-making process designed to protect an organization's assets from possible loss through lawsuits, accidents, and other causes.



Slide 4.14

The primary intent of operational risk management is to eliminate or reduce negligent actions and ensure public safety. This process includes detecting hazards, assessing and controlling risks, and implementing and monitoring risk controls to support effective, risk-based decision making.

- What risks have you encountered while responding to hazmat incidents?
- What steps did you take to eliminate or reduce the risks?



Slide 4.15

Accept No Unnecessary Risk: All emergency operations and daily routines entail risk. *Unnecessary* risk provides no commensurate benefit to safety of a mission. The most logical courses of action for accomplishing a mission are those meeting all mission requirements while exposing personnel and resources to the lowest possible risk. ORM provides tools to determine which risk or what degree of risk is unnecessary.

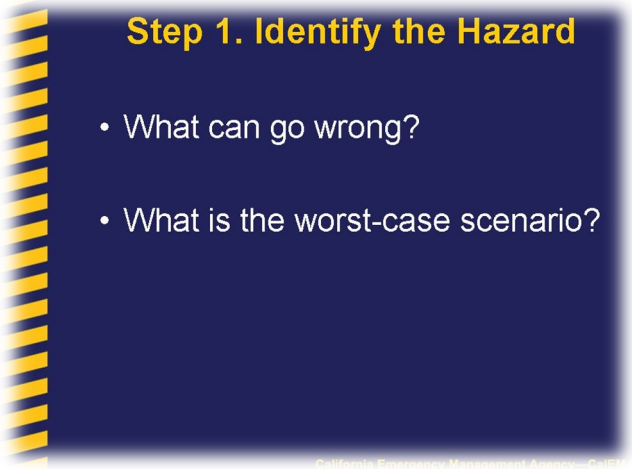
Accept Necessary Risk When Benefits Outweigh Costs: Compare all identified benefits to all

California Specialized Training Institute, 2019

identified costs. The process of weighing risks against opportunities and benefits helps to maximize unit capability. Balancing costs and benefits may be a subjective process open to interpretation. Ultimately, the appropriate decision authority may have to determine the balance. Engage in high-risk endeavors only when the sum of benefits exceeds the sum of costs.

Make Risk Decisions at the Appropriate Level: Depending on the situation, anyone can make a risk decision. However, the appropriate level to make those decisions is that which most effectively allocates the resources to reduce the risk, eliminate the hazard, and implement controls. Leaders at all levels must ensure subordinates are aware of their own limitations and when to refer a decision to a higher level. *Making risk decisions at the appropriate level establishes clear accountability.*

Integrate ORM Into Operations and Planning at All Levels: While ORM is critically important in an operation's planning stages, risk can change dramatically during an actual mission. Therefore, supervisors and senior leadership should remain flexible and integrate ORM in executing tasks as much as in planning for them.



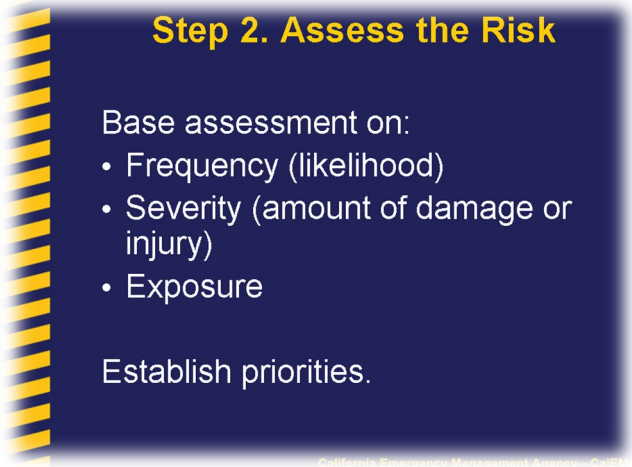
Slide 4.16

Risk identification is the process of making a list of things that might go wrong with an operation. A good rule of thumb is to anticipate the worst that can happen when identifying risks.

If plans are formulated for a worst-case scenario, anything less can be handled. Sources for this information may include past department accident and injury statistics, input from members of the department, and knowledge of the experiences of other emergency service providers.

- What are some real-life examples of things that have gone wrong while responding to a hazmat incident?
- What are some real-life examples of worst-case scenarios?

California Specialized Training Institute, 2019



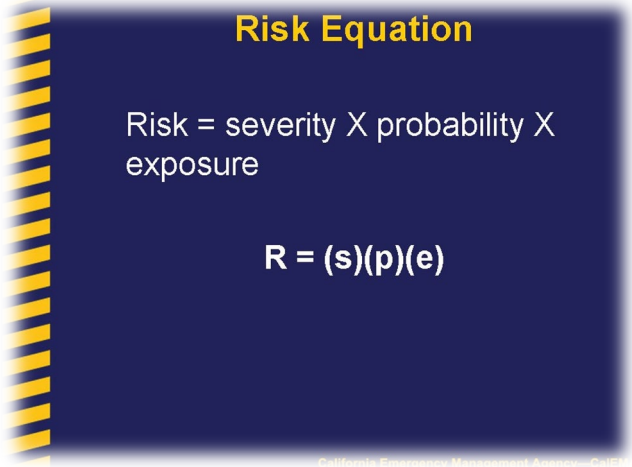
Slide 4.17

Risk management can be thought of in terms of **risk assessment** and **liability prevention**. Once the risks are identified, risks can be evaluated from the standpoint of both frequency and severity.

Frequency is the likelihood that a risk will be encountered.

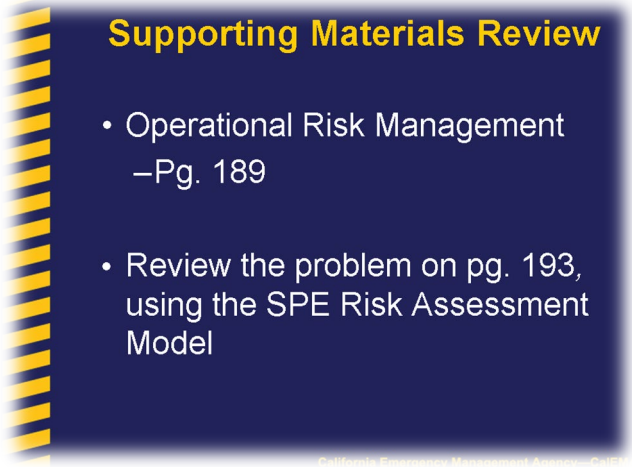
Severity is an indication of how much damage or injury the risk can cause.

Using the information gathered in the identification step, the risks then can be evaluated for their potential severity and frequency of occurrence.



Slide 4.18

This is a more complex and accurate method of assessing risk.



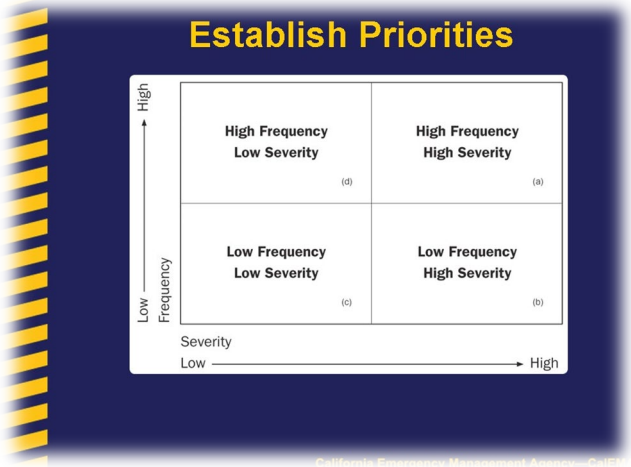
Slide 4.19

Review the listed supporting materials in the participant guide, page 189.

Also review the Risk Assessment Chart, which follows the SPE Risk Assessment Model. This chart provides guidance on actions that should be taken based on a risk value. Values above 80 on the scale indicate very high risks.

Review the sample problem on page 193, using the Risk Assessment Chart.

California Specialized Training Institute, 2019



Slide 4.20

Any risk that has a high likelihood of happening (frequency) and has a great potential for damage and/or injury (severity) should be handled first.

Conversely, risks that have a low likelihood of happening and a low potential for damage and injury would be lower on the priority list. That is, these risks would be addressed later.

Each risk should be placed in one of the four quadrants. For example, a severe risk that is faced all of the time would appear in the upper right-hand quadrant.

A risk that is not severe and is faced infrequently would be placed in the lower left-hand quadrant.

For example, a trip hazard in the decon zone would be placed in quadrant (d), high frequency/low severity. In contrast, chemical exposure to the entry team would be placed in quadrant (b), low frequency/high severity.



Slide 4.21

Even though hazards are always present, we have many methods for minimizing these risks.

Among those methods are:

- Receiving effective training
- Purchasing and maintaining equipment
- Following standard operating procedures
- What are some other examples of risk control measures?

California Specialized Training Institute, 2019



Slide 4.22

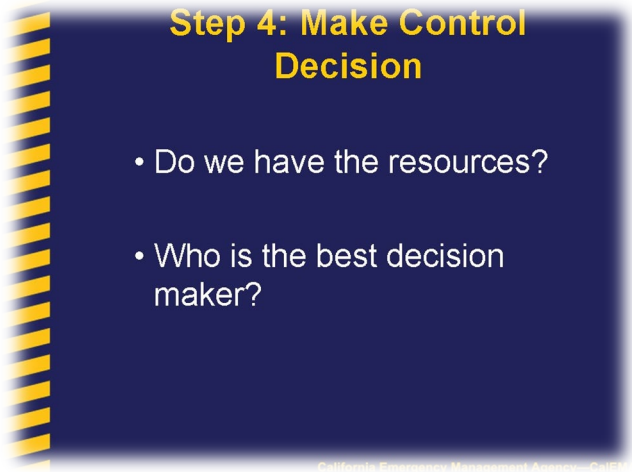
Risk avoidance involves the complete avoidance of a particular risk. Risk control prevents loss from occurring or reduces the severity of consequences.

Risk control measures include personal protective equipment (PPE) and the use of SOPs, such as the Incident Command System.

Risk transfer involves shifting a risk to another organization or, in the case of a financial risk only, to insurance (known as risk financing).

In essence, risk financing is the process of setting aside funds to pay for losses from risk exposures.

Risk monitoring refers to the constant review and evaluation of a risk management program. Risk monitoring ensures that the program is being followed and that it is effective.



Slide 4.23

Once you have identified the best risk control measures, consider whether you have the resources to implement these controls.

Identify the appropriate decision-maker. That decision-maker must choose the best control, or combination of controls, based on the analysis of Step 3.

California Specialized Training Institute, 2019

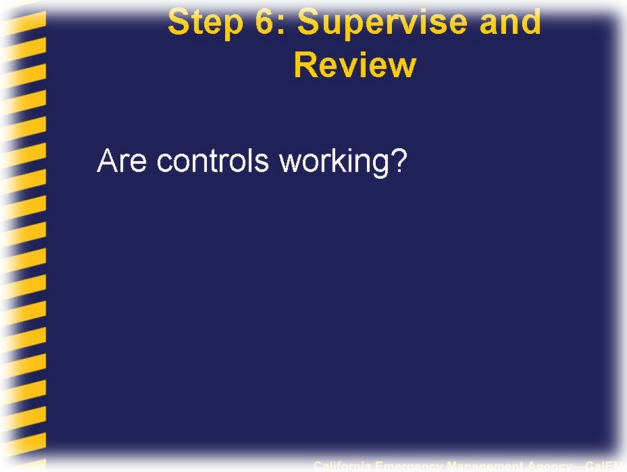


Slide 4.24

Will these controls reduce the risk to an acceptable level?

Management must formulate a plan for applying the controls that have been selected, and then provide the time, materials, and personnel needed to put these measures in place.

- What are some plans you have actually used for risk control?



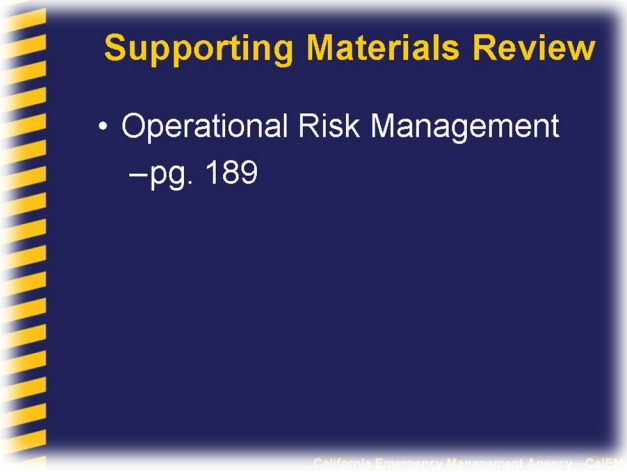
Slide 4.25

Are controls working? Has anything changed?

Once controls are in place, periodically reevaluate the process to ensure their effectiveness.

Workers and managers at every level must fulfill their respective roles to enforce the site safety plan and maintain controls over time.

The ORM process continues throughout the life cycle of the response. *Operational risk management is a continuous process.*

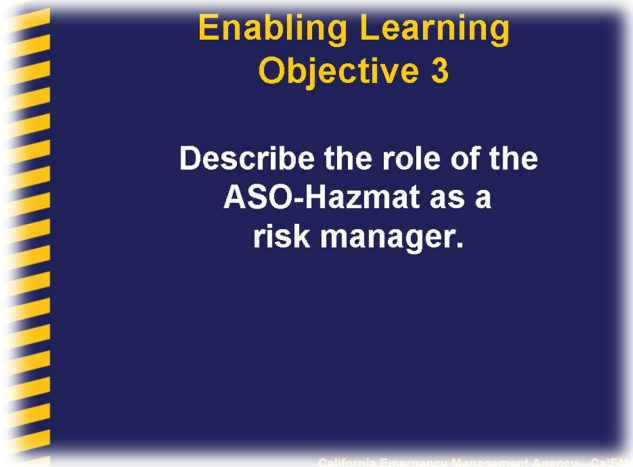


Slide 4.26

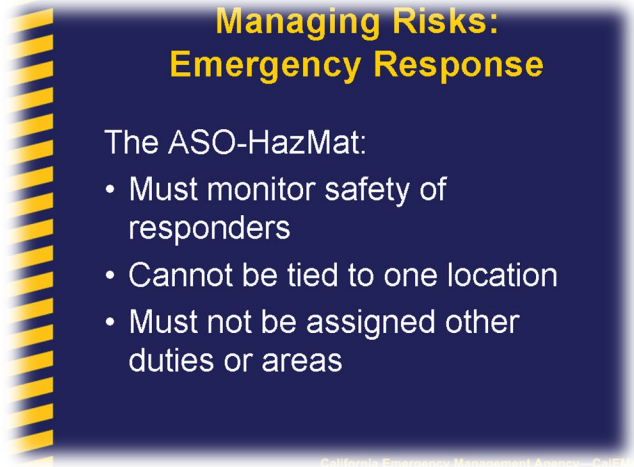
Review the listed supporting materials in the participant guide, page 189.

In addition to information on severity, probability, and exposure, this section provides more detail on the steps involved in ORM.

California Specialized Training Institute, 2019



Slide 4.27

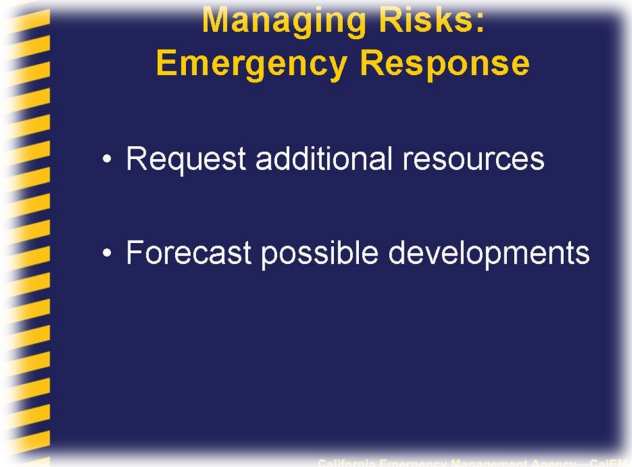


Slide 4.28

The ASO-HazMat and Safety Officer's (SO's) first task as the risk managers for emergency scenes is to ensure that all pre-emergency risk management measures are in use and followed by on-scene responders.

The ASO-HazMat and SO cannot be tied down to a single location since the nature of emergencies is that they are always changing.

Assigning other duties or areas to the ASO-HazMat and SO is inappropriate, given the risks faced by responders at the emergency scene.

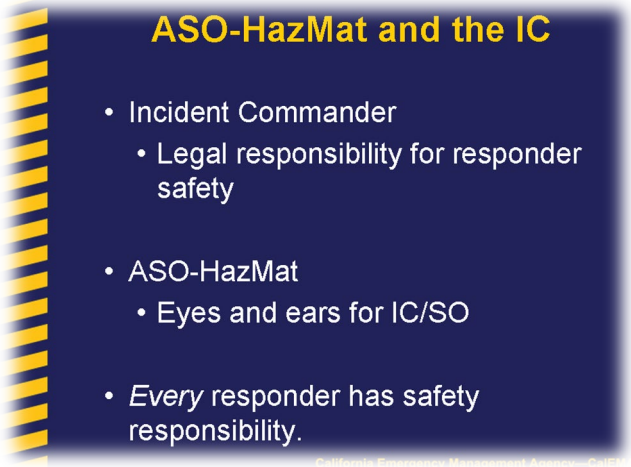


Slide 4.29

The addition of other responsibilities should be a prompt for the SO to ask for Assistant Safety Officers and other resources to manage these tasks.

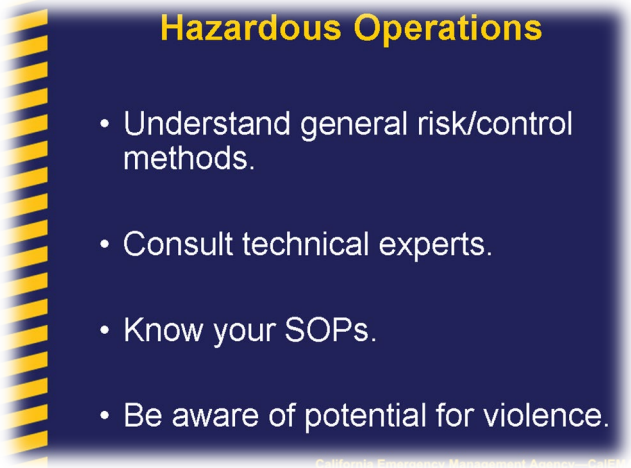
The SO or ASO-HazMat must look for risks of immediate danger to responders, as well as continuously evaluate the emergency scene for risks that may present a danger in the near future.

California Specialized Training Institute, 2019



Slide 4.30

In an Incident Command System (ICS), the Incident Commander has final authority over all activities. At hazardous materials incidents, the ASO-HazMat acts as the eyes and ears of the Incident Commander, Safety Officer, and Hazardous Materials Group Supervisor.



Slide 4.31

Every operation carries with it some risk to responders. The use of every piece of equipment carries with it some hazard to the user. These risks can be minimized by their early recognition and through the use of control measures, such as safety equipment and SOPs/SOGs.

When unsure about how to use a piece of equipment or proceed during an incident, consult technical experts.

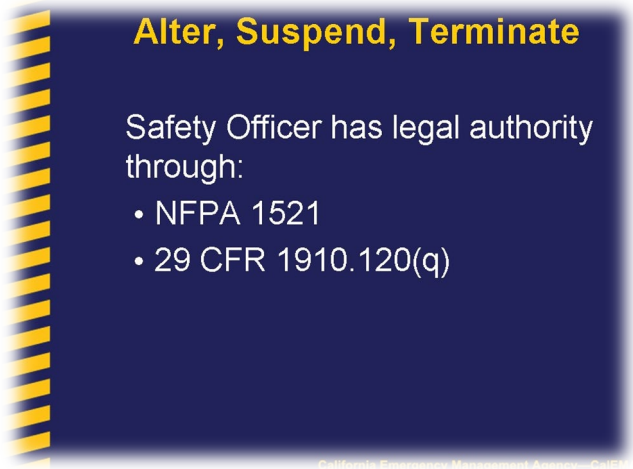
A much more common risk faced by responders today is violence. In the past, emergency response workers were considered neutral in these situations.

The overall positive feeling of the community toward law enforcement, firefighters, and EMS workers provided a feeling of security. Changes in our society and the increasing role of emergency responders in disaster management have increased exposure to the risk of violence.

- Have you ever experienced violence on an incident?

Many police departments now have force protection squads for WMD terrorism/hazmat responses.

California Specialized Training Institute, 2019

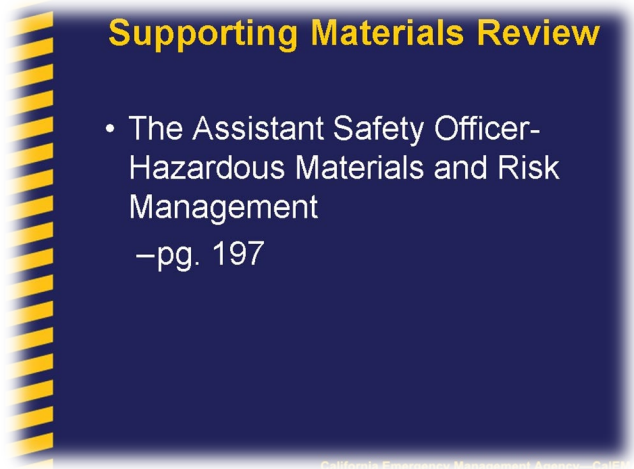


Slide 4.32

When conditions present imminent danger, the SO or ASO-HazMat has legal authority to alter, suspend, or terminate activities. This authority is granted through National Fire Protection Association Standard 1521 and OSHA's HAZWOPER regulation.

Emphasize that the decision to alter, suspend, or terminate a hazmat operation—or a part of an operation—is a serious step. The ASO-HazMat must consider the impact of this action on the rest of the emergency operation.

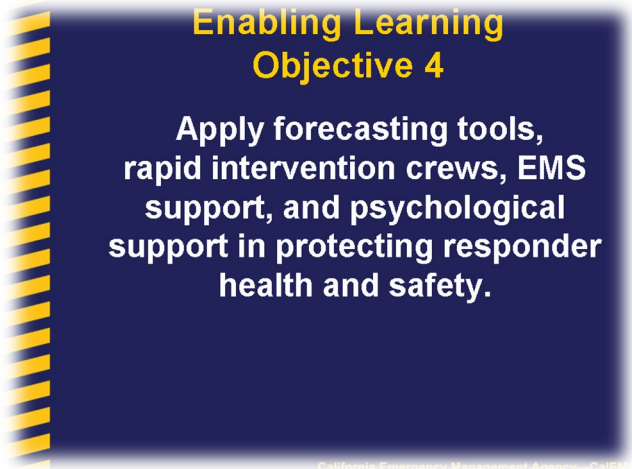
- What do you think would cause you to alter, suspend, or terminate response activities?



Slide 4.33

Review the listed supporting materials in the participant guide, page 197.

This section provides more information on key elements of risk management for the ASO-HazMat and more details on the legal authority to alter, suspend, or terminate emergency response activities.



Slide 4.34

California Specialized Training Institute, 2019

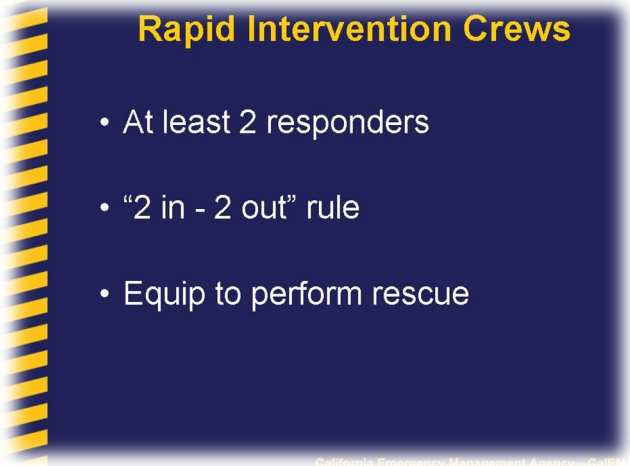


Slide 4.35

Much like a TV meteorologist who uses information provided by the National Weather Service, local radar, and satellite photographs to predict or forecast the weather, the ASO-HazMat can use tools to "predict" the future of an emergency.

Examples of forecasting tools the ASO-HazMat can use during special operations incidents include:

- Sufficient personnel
- Incident durations
- Technical experts
- Proper equipment
- Proper training
- Time



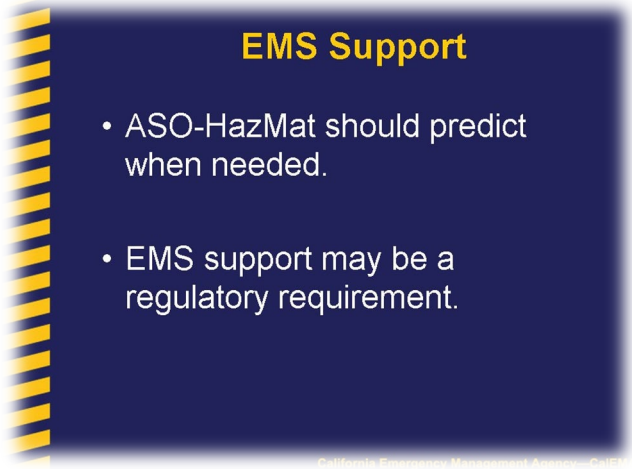
Slide 4.36

Rapid Intervention Crews (RICs) are crews of at least two properly equipped responders who are available to perform a rescue of other responders, if required.

The IC determines the type and number of RICs. The ASO-HazMat should use forecasting skills to provide the IC with information, such as how many individuals it will take to safely extricate all members within the hazard area, to make this decision.

RICs should be staged near the command post or incident control line. This will allow access to and face-to-face communication with the IC and ASO-HazMat.

California Specialized Training Institute, 2019

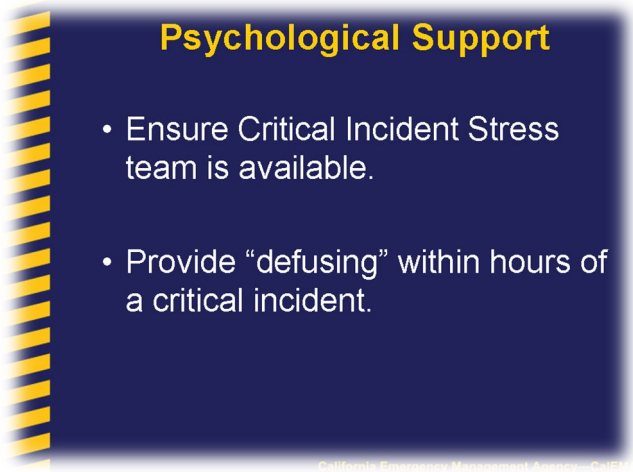


Slide 4.37

As a part of the forecasting process for hazmat emergencies, the ASO-HazMat should attempt to predict the need for emergency medical services (EMS) support. In many communities, the local EMS provider routinely responds to all HazMat calls.

If EMS support is not present on the scene, the ASO-HazMat should forecast the need for this support and request it from the IC, if necessary.

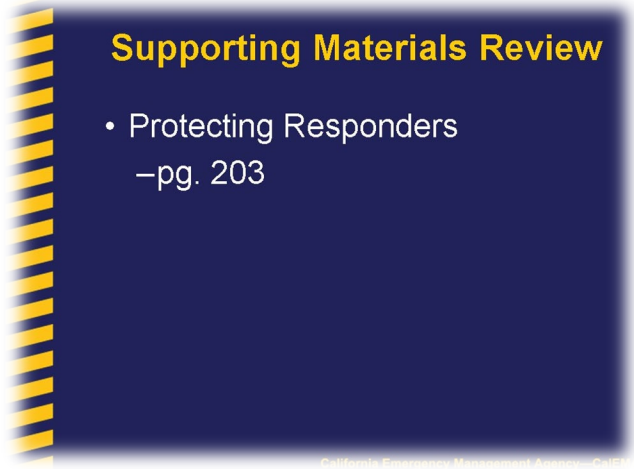
In some cases, the presence of EMS support is required by Paragraph 6-4.5 of National Fire Protection Association Standard 1590. In cases where responders are performing special operations duties, such as control of hazardous materials, the highest available level of EMS should be provided.



Slide 4.38

The ASO-HazMat should ensure that a Critical Incident Stress (CIS) intervention team is available when an incident may have a traumatic effect on the hazmat group or when a critical incident has occurred.

The CIS team should provide an initial CIS defusing and follow up with CIS debriefing, as needed. This request should be made through the Incident Commander.

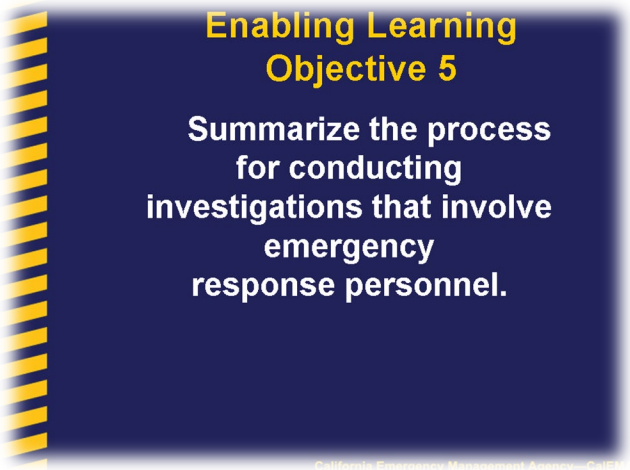


Slide 4.39

Review the listed supporting materials in the participant guide, page 203.

This section provides more information on ways the ASO-HazMat can manage risk to protect responders, such as additional details on RICs, elements of a safety action plan, SOPs for minimizing exposure to violence, CIS defusing, and CIS debriefing.

California Specialized Training Institute, 2019



Slide 4.40



Slide 4.41

Sometimes investigations are required by law, as in the case of a fatality. Sometimes investigations are required by departmental procedures, as in the case of a near miss. Other investigations stem from outside sources, such as OSHA.

Investigations provide information about what went wrong in an accident and the means to avoid that situation in the future.

Investigations give us facts about an incident that can provide the basis for correcting SOPs, developing other control measures to prevent the situation from recurring, and minimizing the negative effects of a recurrence.

Investigations can also provide legal protection. Response agencies may use their investigations as part of their defense against any civil or criminal claim filed by someone who feels that he or she was injured by an action—or lack of action—by the response agency.

California Specialized Training Institute, 2019



Slide 4.42

All accidents, vehicle collisions, exposures, illnesses, injuries, and fatalities must be investigated.

It also is useful to look into the causes of "near misses." These are accidents that almost happen, such as a brush with death at an intersection, during a response. An estimated 300 near misses occur for every injury. There is no need to wait for an accident to happen to make changes for the better.



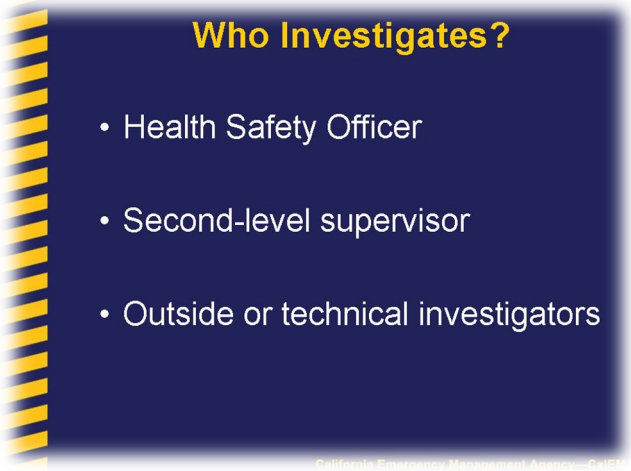
Slide 4.43

In the event of injury to or death of a responder, the investigator must ensure that all reports are completed properly and within the specified amount of time from the date of the incident.

The death of a responder is one of the most stressful events an emergency response agency can experience. It is important to know that the Public Safety Officer's Benefit Program has specific documentation requirements that must be completed before it will release any benefits.

Before being put back into service, all equipment and vehicles should be inspected by a qualified person. If malfunction of equipment, apparatus, or vehicle is suspected of being a factor in a collision, the equipment, apparatus, or vehicle should be impounded.

California Specialized Training Institute, 2019



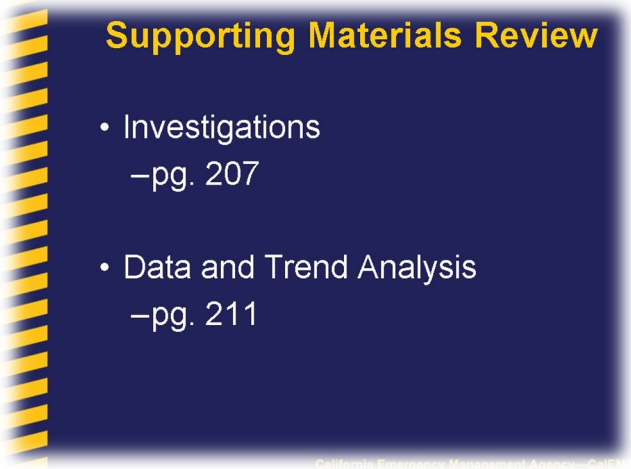
Slide 4.44

The SO or the ASO-HazMat may be required to begin an investigation and submit reports. During an emergency response, they should be relieved of this function as soon as possible. Their main focus is the health and safety of incident responders; they should not be distracted from this important task.

In many agencies, the Health Safety Officer (HSO) will be the primary investigator in all accidents. In large agencies where the response of a single individual is not reasonable, battalion chiefs or other second-level supervisors should be trained to conduct routine investigations.

Other department or outside investigators (such as arson, environmental, criminal, etc.) who have specialized training in investigative techniques may be called in when the HSO or SO need help with an investigation.

The SO may choose to be involved in the investigation of any accident, even those that are considered routine. In any case, the SO should review all accident reports.



Slide 4.45

Review the listed supporting materials in the participant guide, pages 207 and 211. This section provides more information on the topic of investigations, especially on vehicle collisions.

Then turn to page 211 in the guide. The resources in this section, such as links to accident reports and incident case studies, are excellent sources of generic hazard identification. These resources can help to identify trends or problems that may take years to show up on an individual department level.

- Review data provided in these resources.
- Review case studies.
- Create generic hazard identification.

California Specialized Training Institute, 2019



Slide 4.46

We all take risks every day. We take some risks after we evaluate the hazards. We take other risks without much thought. As emergency responders, some of the risks we take, such as on-the-job training activities, are under-appreciated. Some risks result when a task has become mundane and we let our safety attitude relax.

The designated safety official is the risk manager for on-the-job activities at the agency and during a hazardous materials incident. All accidents and injuries result from a sequence, or chain, of events, many of which are "foreseeable."

The SO must use knowledge, training, and experience to recognize the clues that lead to accidents and break the chain. If errors must be made, err on the side of safety. Use backup and RIC teams where required, and provide for safety first.

Keep in mind that the key principles in developing a good risk management program are training, preparedness, documentation, comprehensiveness, and professionalism.

California Specialized Training Institute, 2019

Chapter 4



Supporting Materials/ resource List

risk and risk Management

Some degree of risk is a fundamental reality. We face risks every day. We accept it either consciously or sub-consciously with every decision we make. Every action we take carries with it the chance of an undesirable outcome. Risk is inescapable: It affects us as we work and as we play. No activity is totally without risk.

Risks are as varied as the activities we engage in and the surroundings in which these activities take place. For our purposes, risk can be classified into five general forms:

- Mechanical—such as machinery, noise, collapsing/falling objects, falls, energy sources (thermal and electrical), etc.
- Environmental—such as noise, weather (rain, hail, wind, etc.), thermal (heat and cold), energy (lightning), etc.
- Chemical—such as energy (radiation, thermal, explosion, etc.), corrosion, reactivity, etc.
- Physiological—such as injury from inhalation, injection, ingestion, absorption, abrasion, blunt trauma, etc.
- Psychological—such as anxiety, apprehension, claustrophobia, etc.

Quantifying risk does not in itself ensure safety. Insurance companies are very familiar with the concept of risk. Car insurance premiums for an 18-year-old, single male are much higher than they are for the same man once he is married and 30 years old, all other things being equal. Insurance companies make this decision based on decades of data for millions of drivers. They can quantify this risk to several decimal places. Yet, this information still doesn't make an 18-year-old boy drive any safer.

Risk is often a matter of perspective. Even though the likelihood of getting killed for hazmat responders is greater driving to the scene than entering an exclusion zone, we see the latter as the riskier activity. Driving is something we do every day (and we don't don protective clothing when we get in the car), while hazmat response is a task that the majority of fire departments in California perform less than once a week.

A ten-year study of fatalities among first responders by the U.S. Fire Administration found that almost half—43 percent—of deaths were the result of heart attack. Sixty percent of deaths were among older first responders (40+ years), 27 percent of deaths were the result of trauma, 23 percent occurred as a result of response activities, 18 percent of deaths involved multiple firefighters, and 6 percent of deaths occurred as a result of training.

As we live our lives, we avoid risk. Sometimes we actively think about avoiding risk. Sometimes we just do it without thinking about it. For example, if you choose not to enjoy the thrill of hang gliding because you feel it's too risky, you have completely avoided the risk. But not every risk can be completely avoided. In other cases, we can avoid a significant risk, but not be completely protected from it. If the law enforcement agencies in your area begin referring to a stretch of road as "blood alley," you may choose to use another road during your travels. However, there is still some risk associated with driving on any road, so you have not completely avoided the risk.

California Specialized Training Institute, 2019

All emergency response activities entail some degree of risk. Think about the risks that you face in typical situations:

- Donning a vapor-protective ensemble
- Driving a car
- Attacking a car fire
- Treating the injuries of someone who is trapped in a vehicle collision
- Performing an interior attack on a structure fire

Even though these risks are many and varied, we don't panic over them. We've learned, often the hard way, to control the risk associated with these hazards. As emergency responders, we must be able to identify and control the risks we face as we do our jobs. This activity is known as risk management.

risk Management

In this course, risk management is pre-emptive rather than reactive. The approach is based on the philosophy that it is irresponsible and wasteful to wait until an accident is imminent before taking action to prevent it. We manage risk whenever we modify the way we do something to maximize our chances of success, while minimizing our chances of failure, injury, or loss. It's a commonsense approach to assess a situation, balance the risks against the benefits, and then choose the most effective course of action.

Public safety agencies subject themselves to varying degrees of risk on every call. In emergency response, we take *calculated* risks. Risk management provides the framework to minimize risk, show concern for colleagues, and maximize mission capabilities. This process includes the additional benefits of safeguarding employees' health and welfare, and conserving vital resources and support equipment. Risk management focuses on the mission, the risks involved, and the safeguards in place to ensure the mission's success. Beyond reducing losses, risk management provides a logical process to identify and exploit opportunities to produce the greatest return on our investment of time, dollars, and personnel.

Risk management is a process of tradeoffs. For example, statistics often show that driving to the incident is the activity that causes the most deaths among firefighters while in the line of duty. Yet firefighters respond quickly to an emergency call and take the risk of being in a traffic accident. The tradeoff for taking this risk is saving the lives of others. We make these kinds of tradeoffs every day. Hazardous materials response is no different.

Categories of risk Management

Risk management falls into three categories: non-emergency, pre-emergency, and emergency risk.

Non-emergency risk management looks at the hazards common to all workplaces. This type of risk management might include inspections of the workplace and management offices of emergency response organizations. The risks encountered in these places are no less deadly than those encountered at an emergency scene, but the frequency and severity of these risks will be significantly less.

California Specialized Training Institute, 2019

Pre-emergency risk management looks at the hazard that might happen before an incident occurs. These activities can have a major impact on the safety of on-scene emergency responders. Pre-emergency risk management includes training personnel, purchasing response equipment, and pre-incident planning activities.

Emergency risk management takes place during the incident. Emergency risk management assesses the activities in which the majority of injuries occur—at the emergency. Emergency risk management evaluates the risks and benefits of the incident response activities on citizens and on-scene personnel. This assessment includes evaluating strategy and tactics, estimating hazards, appraising risks and benefits, and judging protective measures.

Limiting Loss Exposures

One of the main goals of risk management is to answer questions about the agency's potential "loss exposures." These are areas or activities that make an agency vulnerable to accidents, injuries, and civil suits.

The fire training course, Fire Command 2B: Management of Major Hazardous Materials Incidents, provides questions and guidelines that the Safety Officer, Assistant Safety Officer-Hazardous Materials, and Health Safety Officer can use to help determine potential loss exposures. These questions and guidelines include:

- Review your agency's loss claim history. Have you been sued before? For what? By whom? How often?
- Review a similar agency's loss claim history. What kinds of suits have been brought against agencies similar to your own?
- Review your policies, procedures and plans for inadequacies, out-datedness, vagueness, or restrictiveness. (Make sure your policies and procedures say what you want them to say. Review the wording for restrictiveness. For example, use of the word *should*, instead of *shall*, will give you more discretion in your actions.)
- Review your training methods and compare them with accepted standards (e.g., 29 Code of Federal Regulations 1910.120). Is your training conducted on a regular basis and documented properly? Do you use videotapes of field exercises and written exams to verify your training? Do you certify competency on an annual basis?
- Establish criteria for performance standards, and enforce for all personnel. Do your personnel demonstrate proficiency on an annual basis?
- Ensure that every specialist is thoroughly trained and aware of the legal considerations.
- Require thorough incident and investigation reports and document all response activities and training.
- Prepare or update your response plans or standard operating procedures to meet current standards and regulatory requirements. Consider using standard operating guidelines.
- Obtain and maintain all necessary equipment to conduct response and recovery operations. Document your actions.
- Review business or facility risk management plans for compliance with regulations.

California Specialized Training Institute, 2019

- Require complete facility inspection records. Issue citations or seek judicial instruction when hazards are seen.
- Ensure that all clean-up contractors are properly bonded, trained, insured, etc.
- Have your legal advisor review your policies and procedures related to response operations.
- Consult with your legal counsel or municipal insurance agent regarding possible risks and exposures.

California Specialized Training Institute, 2019

Operational risk Management

Operational Risk Management (ORM) is a systematic decision-making process to evaluate possible courses of action, identify risks and benefits, and determine the best course of action for any given situation. This process includes detecting hazards, assessing risks, and implementing and monitoring risk controls to support effective, risk-based decision-making.

The Assistant Safety Officer-HazMat (ASO-HazMat) should use ORM after identifying what the response tasks will be and assessing the need for those tasks. The ASO-HazMat can tailor ORM to meet the unique needs and requirements of each response. ORM is both a process and a tool to develop and enhance awareness and understanding of the at-risk activities and behavior of all personnel. ORM is especially useful when regulatory guidance is vague, inapplicable, or does not address specific response requirements.

Principles of Operational risk Management

ORM is based on four underlying principles: accept no unnecessary risk, accept necessary risk when benefits outweigh costs, make risk decisions at the appropriate level, and integrate ORM into planning and operations at all levels. Apply these basic decision-making principles before executing any anticipated job, action, or mission. As an operation progresses and evolves, personnel should continuously employ risk management principles as part of the decision-making process.

Accept No Unnecessary Risk

All emergency operations and daily routines entail risk. *Unnecessary* risk conveys no commensurate benefit to the safety of a mission. The most logical courses of action for accomplishing a mission are those that meet all mission requirements while exposing personnel and resources to the lowest possible risk. ORM provides tools to determine which risk or what degree of risk is unnecessary.

Accept Necessary Risk When Benefits Outweigh Costs

Compare all identified benefits to all identified costs. The process of weighing risks against opportunities and benefits helps to maximize unit capability. Balancing costs and benefits may be a subjective process that is open to interpretation. Ultimately, the appropriate authority for making decisions may have to determine that balance. Engage in high-risk endeavors only when the sum of the benefits exceeds the sum of the costs.

Make Risk Decisions at the Appropriate Level

Depending on the situation, anyone can make a risk decision. However, risk decision should be made at the appropriate level. The appropriate level is determined by who can most effectively allocate the resources to reduce the risk, eliminate the hazard, and implement controls. Leaders at all levels must ensure that subordinates are aware of their own limitations and when they must refer a decision to a higher level. *Making risk decisions at the appropriate level establishes clear accountability.*

California Specialized Training Institute, 2019

Integrate ORM into Operations and Planning at All Levels

While ORM is critically important in an operation's planning stages, risk can change dramatically during an actual mission. Therefore, supervisors and senior leadership should also remain flexible and integrate ORM while executing those tasks.

OrM definitions

Risk is defined as the loss or adverse impact from exposure to various hazards. Risk is also defined as the chance of injury or property damage. Risk generally is a function of severity and probability. Various types of risks are present in any emergency response. This section provides definitions of terms typically used in ORM.

- **Identified Risk**
  Risk that has been determined to exist. Identified risk is arrived at through the use of analytical tools. The time and cost to conduct analysis, the quality of the risk management program, and the state of the technology involved affect the amount of risk that can be identified.
- **Unidentified Risk**
  Risk that has not yet been identified. Some risk is not identifiable or measurable. Mishap investigations may reveal some previously unidentified risks.
- **Total Risk**
  The sum of identified and unidentified risk. Ideally, identified risk will comprise the larger portion of the two.
- **Acceptable Risk**
  The part of identified risk that is allowed to persist after controls are applied. Risk can be determined as acceptable when further efforts to reduce it would degrade the probability of the operation's success.
- **Unacceptable Risk**
  That portion of identified risk that cannot be tolerated and must be avoided, eliminated, or controlled.
- **Residual Risk**
  The portion of total risk that remains after efforts to manage the risk have been employed. Residual risk is comprised of acceptable risk and unidentified risk.

Other terms related to risk include:

- **Severity**
  An event's potential consequences (e.g., degree of damage, injury, or impact on a mission).
- **Probability**
  The likelihood an individual event will occur.

California Specialized Training Institute, 2019

- **Exposure**
  The amount of time, number of cycles, number of people involved, and/or amount of equipment involved in a given event, expressed in time, proximity, volume, or repetition.
- **Mishap**
  An unplanned single event or series of events that cause death, injury, occupational illness, or damage to/loss of equipment or property.
- **Hazard**
  Any real or potential condition that can endanger a mission; cause personal injury, illness, or death; or damage equipment or property.
- **Risk Assessment**
  The systematic process of evaluating various risk levels for the specific hazards that are identified with a particular task or operation. Various models are available to complete this step in the ORM process.
- **Risk Rating Scale**
  A scale of specific risk degrees, determined during the steps for ORM risk assessment. An Assistant Safety Officer could describe a risk as being low, medium, or high, which are the safety industry's standard terms. However, each agency will define low, medium, and high risk in ways that are meaningful to its own personnel.

Steps of ORM

ORM is a continuous, systematic process and tool for improving individual and operational performance in all functional areas and operations. ORM consists of six steps: identify the hazard, assess the risk, analyze risk control measures, make control decisions, implement risk controls, and supervise and review.

Step 1: Identify the Hazard

A hazard is defined as any real or potential condition that can cause degradation, injury, illness, death, or damage to/loss of equipment or property. Use appropriate hazard identification techniques to identify the hazards associated with the operation or activity. Experience, common sense, and specific analytical tools help identify hazards.

Ask yourself: What can go wrong? What can go wrong with equipment, with the environment, with personnel?

- **Equipment:** Is equipment functioning properly and will it do so throughout the planned tasks? Is your equipment adequate for the materials involved?
- **Environment:** How will weather, geographic influences, physical barriers, workplace climate, and available light affect the response?

California Specialized Training Institute, 2019

- **Personnel:** Are personnel properly trained and capable of handling the tasks? Are they fatigued, complacent, or subjected to physical or mental stress?

Identify Risks

Risks to personnel are as varied as the types of activities we engage in and the surroundings in which they occur. However, risks can be classified into five general forms: mechanical, environmental, chemical, physiological, and psychological.

- Mechanical risks include machinery, noise, collapse/falling objects, falls, energy sources (thermal and electrical), and similar hazards.
- Environmental risks include noise, weather (rain, hail, wind, etc.), thermal (hot and cold), energy (lightening), and similar hazards.
- Chemical risks include energy (radiation, thermal, explosion, etc.), corrosion, reactivity, and similar hazards.
- Physiological risks include injury by inhalation, injection, ingestion, absorption, abrasion, blunt trauma, and similar hazards.
- Psychological risks include anxiety, apprehension, claustrophobia, and similar hazards.

In certain types of incidents, state and/or federal statutes may dictate some of the risks that safety officials must assess. For example, federal law requires that, "Once the presence and concentrations of specific hazardous substances and health hazards have been established, the risks associated with these substances shall be identified. Employees who will be working on the site shall be informed of any risks that have been identified."

Risks to consider include, but are not limited to:

- Exposures exceeding the permissible exposure limits and published exposure levels
- Immediately dangerous to life or health (IDLH) concentrations
- Potential skin absorption and irritation sources
- Potential eye irritation sources
- Explosion sensitivity and flammability ranges
- Oxygen deficiency

Checklists are excellent tools for identifying risks and avoiding losses. Checklists (such as incident, workplace safety, and operational checklists) are the result of employee experience and injury or illness forecasting.

Step 2: Assess the Risk

If something goes wrong, how will it affect us? Are these risks unacceptable? By assessing the risk, we can answer those questions. The assessment step is the application of quantitative and qualitative measures to determine the level of risk associated with specific hazards. This process defines the probability and severity of an accident that could result from the hazards, based upon the exposure of humans or assets to the hazards.

California Specialized Training Institute, 2019

One way to assess risks in a specific operation, such as a hazmat response, is called the Severity, Probability, and Exposure (SPE) Risk Assessment Model. This model seeks to quantify risk as a function of severity, probability, and exposure [i.e., Risk = f (S)(P)(E)]. To calculate risk, the SPE model uses the formula Risk = Severity x Probability x Exposure. This model also can be applied to assessing the risk involved in hazmat responses.

Hazmat SPE Risk Assessment Model

Severity		Container Size	OR	Severity		Material State
1	Slight	Small		1	Slight	Solid
2	Minimal	Less than 55 gallons		2	Minimal	Liquid w/low VP
3	Significant	More than 55 gallons		3	Significant	Liquid w/high VP
4	Major	Small pressure vessel/gas cylinder		4	Major	Flammable/Toxic Gas
5	Catastrophic	Large pressure vessel/gas cylinder		5	Catastrophic	Explosive/BLEVE potential

X (multiplied by)

Probability		Stress
1	Impossible/Remote	No stress
2	Unlikely	Possible mechanical stress
3	50/50	Mechanical stress visible
4	Greater than 50%	Thermal or chemical stress
5	Very Likely	Combined stress

X (multiplied by)

Exposure		People
1	None	Vacant land
2	Average	Some structures nearby, possibly occupied
3	Above Average	Many structures nearby, confirmed occupied
4	Great	People and structures adjacent to scene

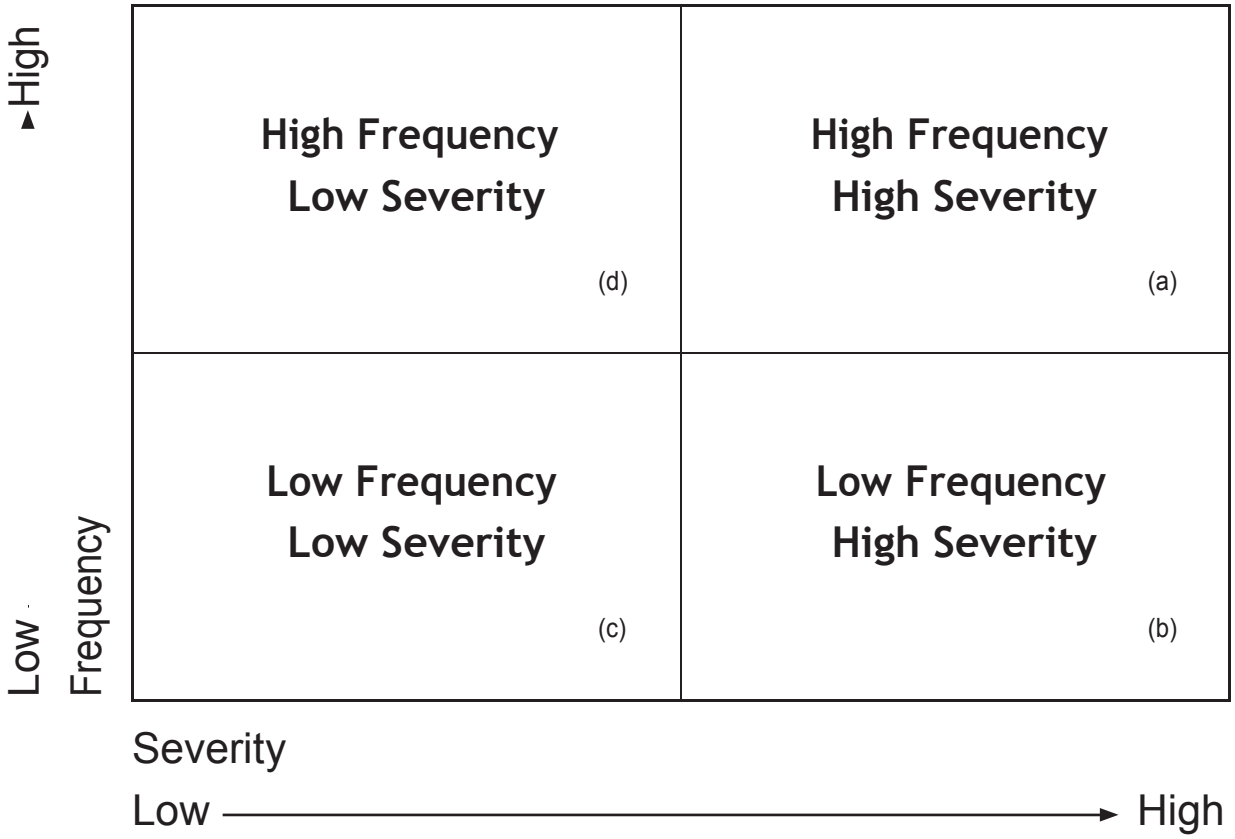
Risk Assessment Chart		
Values	***Degree of Risk***	***Guidance***
80–100	Very High	Discontinue, Stop (Complete Risk-Benefit Analysis)
60–79	High	Correct Immediately (PPE needed)
40–59	Substantial	Correction Required (Containment needed)
20–39	Possible	Attention Needed (Isolate and notify)
1–19	Slight	Risk Possibly Acceptable (Notify)

Sample Problem

To use the SPE model to calculate risk for hazmat responses, take a value from one of the Severity tables and multiply it by a value from the Probability table and by a value from the Exposure table. Then compare the total to the values in the Risk Assessment Chart. For example, suppose you had a liquid with a high VP (Severity value = 3) combined with a thermal or chemical stress (Probability value = 4) and a situation where people and structures were adjacent to the scene (Exposure value = 4). 3 X 4 = 12; 12 X 4 = 48. Looking at the Risk Assessment Chart, a value of 48 constitutes substantial degree of risk and the guidance recommends containment.

California Specialized Training Institute, 2019

Another way to classify risk is to consider a risk's frequency and severity. Using the graphic that follows, a risk should be placed in one of the four quadrants. For example, a severe risk that is faced all of the time would appear in the upper right-hand box and a risk that is not severe and is faced infrequently would be placed in the box in the lower left-hand corner. In general, high frequency, high severity risks would be addressed first and low frequency, low severity risks would be addressed later.



Step 3: Analyze Risk Control Measures

What can we do to reduce the risk? Investigate specific strategies and tools that reduce, mitigate, or eliminate the risk. All risks have three components: probability of occurrence, severity of the hazard, and the exposure of people and equipment to the risk. Effective control measures reduce or eliminate one or more of these components. For example:

- Using personal protective equipment helps control s*everity*.
- Training, situational awareness, rest, and work duration management help control *probability*.
- Restricting access to the scene, reducing the number of people involved, and reducing the number of events, cycles, or entries help control *exposure*.

The risk analysis must take into account the overall costs and benefits of remedial actions, providing alternative choices, if possible.

California Specialized Training Institute, 2019

Several standard methods are used to control risks. They are risk avoidance, risk control, risk transfer, and risk financing.

Risk Avoidance

This method involves the complete avoidance of a particular risk. For example, if a bridge in a community is unstable, the risk avoidance method would prevent fire apparatus or other emergency vehicles from using the bridge. Thus, the risk from the bridge would be completely avoided. However, the safety of the alternate routes would need to be considered.

This method of risk management is of little value in protecting emergency responders from risks on the emergency scene. Emergency scene operations are dangerous. These dangers cannot be completely avoided. So, emergency service organizations use the next risk management method, control measures, to address risks on the emergency scene.

Risk Transfer

This method involves transferring a risk to another organization or, in the case of a financial risk only, to insurance (known as risk financing). If an emergency response organization concludes that inspections of gasoline tankers are just too risky to be performed by their members, the organization could contract with an outside agency to perform the inspections. Thus, the risk is transferred from the emergency organization to an outside organization.

Risk Financing

In cases where the risk is purely financial, such as risk of a fire in an unoccupied building owned by an emergency response organization, insurance can be purchased to protect the emergency response organization. In essence, this is the process of setting aside funds to pay for losses from risk exposures.

Keep in mind that risk financing does not eliminate the risk or reduce the chances of an accident or injury occurring. Risk financing only provides compensation if something goes wrong. The tradeoff is that the less you control risks (use prevention methods), the more you need to plan for financing risk.

Risk Control = Risk Financing

Risk control and risk financing are closely integrated. An agency that expends little in risk control efforts must compensate by spending more on risk financing. An agency that expends a great deal of effort on risk control will have to spend little on risk financing.

This may help to explain why responders sometimes feel that they are not given the training and/or equipment they feel is necessary (risk control) to perform their tasks. Agency managers must assess the cost/benefit relationship between risk control and risk management when doling out limited resources.

Step 4: Make Control Decisions

Do we have the resources to implement these controls? Identify the appropriate decision-maker. That decision-maker must choose the best control, or combination of controls, based on the analysis of Step 3.

California Specialized Training Institute, 2019

Step 5: Implement Risk Controls

Will these controls reduce the risk to an acceptable level? Management must formulate a plan for applying the controls that have been selected, and then provide the time, materials, and personnel needed to put these measures in place.

Step 6: Supervise and Review

Are controls working? Has anything changed? Once controls are in place, periodically reevaluate the process to ensure their effectiveness. Workers and managers at every level must fulfill their respective roles to enforce the site safety plan and maintain controls over time. The ORM process continues throughout the life cycle of the response. *Risk management is a continuous process.*

Fire Department Risk Management

All fire departments should develop and adopt an official, written risk management plan (National Fire Protection Association Standard 1500, *Standard on Fire Department Occupational Safety and Health Program*). The risk management plan must cover all fire department facilities and operations and use the methods for managing risk described in ORM. Risk management plans also should be developed for other emergency response organizations, such as EMS departments.

The risk management plan should look at every function, both non-emergency and emergency, performed by the organization. The plan should identify the risks associated with each operation, evaluate and classify the risks by frequency and severity, and prioritize those. Similarly, the plan should identify, evaluate and classify, and prioritize the risks the organization faces as a whole. Equally important, the plan should suggest the development of risk control measures.

During emergency activities, the Incident Safety Officer performs risk control measures. However, department facilities and non-emergency activities do not usually fall under the responsibility of the Safety Officer. These duties come under the jurisdiction of the department's Health and Safety Officer. It is the responsibility of both these individuals to monitor the effectiveness of the risk control measures.

California Specialized Training Institute, 2019

The Assistant Safety Officer-Hazardous Materials and risk Management

Every responder at the scene of the emergency has a safety responsibility. Every individual member has a duty to be safe, to watch out for the safety of other on-scene responders, and to cooperate with safety procedures. But the Assistant Safety Officer-Hazardous Materials (ASO-HazMat) plays a very specific role in ensuring the safety of all on-scene personnel and hazmat responders. The ASO-HazMat is responsible for monitoring and assessing safety hazards or unsafe conditions and for developing safety measures. To that end, it is important for the ASO-HazMat to have a clear understanding of the various roles and lines of authority within the Incident Command System.

The Safety Officer and ASO-HazMat As risk Managers

The Safety Officer's (SO's) or ASO-HazMat's first task as risk manager for an emergency response is to ensure that all pre-emergency risk management measures are in use. For example, in a hazmat incident, the ASO-HazMat must make sure the use of Support, Contamination Reduction, and Exclusion Zones for hazmat emergencies is in place. The ASO-HazMat must also ensure that safety equipment is in place and that all on-scene responders are properly protected and follow safety measures.

Emergencies are dynamic events, so the SO or ASO-HazMat must continually monitor the emergency scene. A scene that is safe at one moment may not be safe half an hour later.

Conducting risk control measures is an essential part of the SO's and ASO-HazMat's responsibilities. The Incident Commander (IC) depends on the SO and/or the ASO-HazMat to monitor the scene's safety. This responsibility may require the SO or ASO-HazMat to issue corrective instructions to on-scene emergency responders. This does not mean that the SO or ASO-HazMat need to take on the role of safety cop. Safety on the emergency scene is too important to be turned into a game of catching and punishing errors. If problems arise, the SO or ASO-HazMat should correct those problems in the simplest way possible. Responder safety is the key goal.

Designating the Safety Officer or ASO-HazMat

The SO and the ASO-HazMat must be well versed in the emergency response agency's procedures and the dangers that are present at emergency scenes. Most agencies will not designate an SO or ASO-HazMat before an emergency. Very few agencies have the staffing and emergency call volume necessary to hire an on-duty SO or ASO-HazMat. The agency's Health Safety Officer (HSO), if qualified, may perform the duties of SO or ASO-HazMat. Some volunteer organizations, such as volunteer fire departments, may designate an individual to serve as an SO. However, other members of the department may fill the position when the designated SO is unavailable.

The IC at the scene of an emergency may also choose an SO or ASO-HazMat from members of the agency, or allied agency, that are available to serve. The IC must take care to select an individual who possesses the experience, knowledge, and ability to perform the functions of an SO or ASO-HazMat adequately.

California Specialized Training Institute, 2019

Duties at the Emergency Scene

Whether designated beforehand or chosen at the scene, the SO's or ASO-HazMat's only job at the scene of an emergency is to monitor the safety of responders. The IC and all of the responders at the scene of the emergency will count on this person to keep a focus on safety. The SO or ASO-HazMat must watch out for risks that may harm responders and predict or forecast what will happen if emergency operations continue. Prior experience working at emergencies, training in emergency operations and safety, knowing safety cues, and intuition are all important skills and characteristics for an effective SO or ASO-HazMat.

The SO cannot be tied down to a single location since the nature of emergencies is that they are always changing. Assigning other duties or areas to the SO is inappropriate, given the risks faced by responders at the emergency scene. The addition of other responsibilities should be a prompt for the SO to ask for Assistant Safety Officers to manage these tasks.

The SO or ASO-HazMat must look for risks of immediate danger to responders as well as continuously evaluate the emergency scene for risks that may present a danger in the near future.

Keep in mind that three key elements for effective risk management during an emergency response are to:

- **Have a Plan**
  Develop a plan for monitoring the conditions of an incident and for following the actions that will be taken. Checklists can be very helpful for this purpose.

- **Establish a Rehabilitation Area**
  Designate an area for rehabilitation and ensure adequate supplies. When emergency responders become fatigued, their ability to operate safely becomes impaired. A rehabilitation area provides responders with opportunities to rest, rehydrate, and recuperate from the physical and mental demands of the emergency response. In addition, monitor responders regularly to anticipate and recognize when they are becoming fatigued.

- **Ensure Proper Documentation**
  Record the events and activities within each ICS function and position through proper documentation. Departments and agencies use such documentation to analyze the actions and events that occurred during an incident and to identify processes for future improvement. Such documentation is especially important in the event of injury or death. Proper documentation can protect the agency from large dollar losses and, in some cases, ensure that workers' rights and benefits are protected. For these and other reasons, it is wise for the ASO-HazMat to become familiar with an agency's needs and procedures for documentation *before* an incident occurs.

The ASO-HazMat and the Incident Commander

The IC has overall legal responsibility for the safety of responders working at an emergency scene. That responsibility cannot be delegated. The SO and the ASO-HazMat assist the IC with safety, acting as the IC's eyes and ears on matters related to responder safety in incidents involving hazardous materials.

The ASO-HazMat reports directly to the SO or, when there is no SO, to the IC as a part of an incident management system. (The IC also functions in the capacity of the SO when an SO has not been assigned

California Specialized Training Institute, 2019

to an incident.) This allows the ASO-HazMat to communicate directly with the IC without the fear that a message will be scrambled in transmission. This position reflects the importance of the ASO-HazMat's role at the emergency scene.

The ASO-HazMat and the Health Safety Officer

The HSO acts as the risk manager for the department, agency, or organization on a daily basis. For example, when an HSO is involved in equipment specifications, he or she is acting as an internal safety consultant. The HSO brings a valuable safety perspective to all meetings and can provide important input to other members concerning responder safety. When appropriate, the HSO should be involved in all operations the emergency response agency or division performs.

Occasionally, the ASO-HazMat and the HSO is the same individual. When these two roles are performed by different individuals, especially from different agencies, conflicts in interpretation, procedure, or policy may occur. When a conflict does occur, it is the responsibility of the ASO-HazMat and HSO to reach a decision they both find acceptable. In situations where they reach an impasse, the final responsibility and decision lie with the IC.

Hazardous Operations and Equipment

Every operation carries with it some risk to responders. Similarly, every piece of equipment carries with it some hazard to the user. However, these risks can be minimized when they are recognized early on. Applying control measures, such as safety equipment, standard operating procedures, and standard operating guidelines, can also minimize these risks.

Ten-year Fatality Study

Heart attack	43%
Trauma	27%
Multiple firefighters	18%
40+ suffer 60% of deaths	
EMS	3%
Training	6%
Response	23%

1999 highest death rate (112) since 1978 excluding the attacks of Sept. 11

Training Exercises

Some of the most dangerous non-emergency activities that responders can perform are live simulations of emergency operations. Examples of these activities include range practice (pistol and rifle), training for structural fires, and training for special operations (such as Urban Search and Rescue). Risks during training exercises mirror the risks during emergency operations. The HSO, SO, and Assistant Safety Officer-Hazardous Materials (ASO-HazMat) should apply the same risk management techniques during these training events as he or she would use during actual emergencies.

California Specialized Training Institute, 2019

As the agency's internal safety consultant, the HSO should be involved in planning for all training exercises. The HSO should develop a safety action plan for each exercise, and the exercise's Incident Commander should review the plan.

The safety action plan should include:

- Consideration of type of exercise to be conducted
- Risk management evaluation of the hazards that may be encountered
- Review of applicable standards or regulations governing the type of exercise
- Preparation of a checklist of hazards to be aware of during the exercise
- Speaking points for the safety section to use at a pre-exercise briefing

Incidents Involving Violence

An increasingly common risk that responders face today is violence that erupts at the incident. In the past, the overall positive feeling of the community toward law enforcement, firefighters, and EMS workers provided a feeling of security. Changes in our society and the increasing role of emergency responders in disaster management have increased exposure to the risk of on-scene violence.

Some members of the community may view emergency responders as extensions of the government. This point was brought home to responders during the civil disturbance of 1992 in Los Angeles and the surrounding area. Police or National Guard escorts were required so firefighters and EMS workers could perform their jobs, and one responder was seriously injured by gunfire.

Our exposure to violence can come in many forms, some much less spectacular than civil disturbances. Law enforcement officers, firefighters, and EMS personnel are exposed to violence when responding to bomb threats, assaults, shootings, stabbings, domestic violence, robberies, hostage situations, drive-by shootings, and in support of police operations, such as raids on drug houses or drug labs. In most cases, the supervisor who is communicating with law enforcement is in the best position to judge the safety of the scene.

Emergency responders have at least two ways to address the increased exposure to violence: community involvement and the use of SOPs. Agency SOPs should detail the procedures responders should use in these situations. SOPs might include the following procedures:

- Stay out of the hazard area until law enforcement officials have stabilized or secured the situation.
- Move the victim to a safe area so treatment can be initiated.

In the early stages of an incident when an SO has not yet been assigned, the company officer or immediate supervisor is in the best position to judge the safety of the scene.

California Specialized Training Institute, 2019

Alter, Suspend, or Terminate

The SO and ASO-HazMat have the authority to alter, suspend, or terminate an activity. However, this authority must be balanced between the need to protect the lives of responders and the SO's or ASO-HazMat's role in the incident management system. The SO and the ASO-HazMat are support officers for the IC. The IC counts on the SO, or in the case of hazmat incidents, the ASO-HazMat, to look out for the safety of responders and to inform the IC of situations that present risks to responders. In most cases, when the SO or the ASO-HazMat spots a risk to the safety of responders, the SO or ASO-HazMat can take minor corrective action to address the problem. (For example, asking a responder to wear gloves or coordinating with a division or group supervisor to establish a collapse zone.)

If time permits, the SO or ASO-HazMat should consult face-to-face with the IC before terminating an operation. This step may improve the overall safety of the operation. It is extremely rare for an ASO-HazMat to terminate an operation without first consulting with a supervisor or the IC. Such actions are reserved for hazards that place responders in imminent danger.

If an ASO-HazMat decides to terminate, suspend, or alter a significant part of an operation without consulting a supervisor or the IC, the ASO-HazMat should be able to defend the decision as valid without engaging in hours of discussion and consideration. (Even when an ASO-HazMat's decision is valid, the IC may choose to reverse the decision and continue an operation.) It is in the best interest of the ASO-HazMat, the IC, and the on-scene responders to keep communications between the ASO-HazMat and the IC positive and supportive.

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

These decisions tend to be viewed as significant events and often are remembered for a long time by both the IC and the ASO-HazMat. The ASO-HazMat's only job is responder safety. Career considerations must take a back seat to the ASO-HazMat's primary function—safety.

Safety Officer Legal Authority

National Fire Protection Association Standard 1521, 2-3.3 reads:

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

The OSHA Hazardous Waste Operations and Emergency Response regulation (q) (3) (viii) reads:

> When activities are judged by the safety official to be 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.

California Specialized Training Institute, 2019

Protecting responders

Given the fact that emergency scenes are dangerous places where situations rapidly change, the Assistant Safety Officer-Hazardous Materials (ASO-HazMat) must monitor the safety of responders constantly. The ASO-HazMat must be concerned with hazards or risks that present an immediate danger to responders or that may become dangerous to responders. As a result, the ASO-HazMat must be knowledgeable about tools and resources for forecasting an emergency, rescuing responders, providing medical assistance, and minimizing risks from hazardous operations and violence.

Forecasting

No member of the emergency services, not even the ASO-HazMat, has a crystal ball that can be used to predict the future with 100-percent accuracy. The ASO-HazMat must call on experience, training, safety cues, and intuition to get ahead of the emergency and predict developments that will affect the safety of responders. This means that most accidents are "foreseeable," if an ASO-HazMat uses his or her skills.

Much like a TV meteorologist who uses information provided by the National Weather Service, local radar, and satellite photographs to predict or forecast the weather, the ASO-HazMat can use tools to predict the future of an emergency. Examples of forecasting tools the ASO-HazMat can use during special operations incidents include:

- Incident durations
- Technical experts
- Proper equipment
- Proper training
- Sufficient personnel
- Time

Generally, time is less of a factor, because more time equals better preparation. Time can also be an enemy. When incidents drag on, responders may be less aware of hazards and drop their guard.

rapid Intervention Crews (rICs)

Sometimes things go wrong in an emergency response and crews cannot quickly exit the hazard area. Sometimes responders need to be rescued. If that happens during an emergency that involves weapons of mass destruction or hazardous materials, a rapid intervention crew (RIC) will be called in. RICs are crews of at least two properly equipped responders who are available to perform a rescue of other responders, if required.

During special operations emergencies, the Incident Commander (IC) must evaluate the hazards and risks of every emergency situation and assign RICs, as needed [29 Code of Federal Regulations 1910.120(q), Title 8 §5192(q) and Section 6-5 of National Fire Protection Association Standard1500]. The ASO-HazMat should use forecasting skills to provide the IC with information on the number and type of RICs

California Specialized Training Institute, 2019

that will be needed. This decision should be based upon the number of individuals it will take to safely extricate all members within the hazard area.

In the early stages of an incident, when only one crew is operating in the hazardous area, a minimum of one standby responder may be required outside of the hazard area. After a second crew enters the hazard area, additional RICs are required. Initially, RICs may be made up of responders dedicated to that mission. RICs may also be made up of on-scene emergency responders who are performing other tasks, but are ready to re-deploy and perform RIC functions. As the incident increases in size or complexity, RICs must be made up of on-scene responders dedicated to the task or by a company (or companies) of responders in a staging area or on the scene of the emergency. In cases where responders are in the hazard area of a special operations incident or where responders are in an area where an equipment malfunction could lead to their incapacitation, the activation of at least one RIC is required.

RIC personnel must always maintain a "ready for assignment," or RFA, position. They must be ready to move into the hazard area at any time to perform a rescue. They must also be equipped with protective clothing and equipment that will allow them to operate safely in the hazardous area. RICs should be staged near the command post or incident control line. This will allow access to and face-to-face communication with the IC and ASO-HazMat. The IC will be able to quickly reach the RIC, provide sound information on where help is needed, and send the RIC on its way.

The IC is the person who is most likely to have accurate, reliable information on the location of responders in need of rescue. When members of an on-scene emergency crew learn that other responders need immediate assistance, their instinct is to rush to where they think their help is needed. Often, the information they have is inaccurate and their efforts are wasted.

Many fire departments use the RIC concept, but do not use the RIC name. The New York City Fire Department, for example, uses FAST companies (Firefighter Assistance and Search Teams) to stand by in case firefighters need to be rescued. An extra truck is added to second alarm or greater responses to perform this function. There is no magic in the name; the concept of responders dedicated to the mission of rescue is the most important feature.

Emergency Medical Support

As a part of the forecasting process for hazardous materials emergencies, the ASO-HazMat should attempt to predict the need for emergency medical services (EMS) support. In many communities, the local EMS provider routinely responds to all hazmat calls. If EMS support is not present on the scene, the ASO-HazMat should forecast the need for this support and request it from the IC, if necessary.

In some cases, the presence of EMS support is required by Paragraph 6-4.5 of National Fire Protection Association Standard 1590. In cases where responders are performing special operations duties, such as control of hazardous materials, the highest available level of EMS should be provided. At a minimum, this support must provide basic life support (BLS) and medical transportation. At all other emergency incidents, the IC must evaluate the risks to responders and, if necessary, request on-scene standby EMS support at the BLS-level or above. The ASO-HazMat should assist the IC with this decision.

Once EMS support has arrived, the ASO-HazMat should ensure that they are prepared to provide service to on-scene responders involved in the incident. The EMS crews should get out of their vehicles and

California Specialized Training Institute, 2019

watch for responders who are too fatigued to continue working. The ASO-HazMat should also attempt to secure higher-level EMS providers, such as paramedics, whose training can provide the highest level of care for injured responders.

Psychological Support

In addition to ensuring physical health and safety, departments have an obligation to provide psychological support for its personnel, especially after a critical incident. Critical incidents are traumatic events that cause powerful emotional reactions in people who are exposed to those events. Every profession can list their own worst-case scenarios that can be categorized as critical incidents. Emergency services organizations, for example, usually list the *Terrible Ten*. They are

1. Line-of-duty deaths
2. Suicide of a colleague
3. Serious work related injury
4. Multi-casualty /disaster/terrorism incidents
5. Events with a high degree of threat to the personnel
6. Significant events involving children
7. Events in which the victim is known to the personnel
8. Events with excessive media interest
9. Events that are prolonged and end with a negative outcome
10. Any significantly powerful, overwhelming distressing event

When a critical incident has occurred, the ASO-HazMat should ensure that a professional team is available to provide Critical Incident Stress Debriefing (CISD). Requests for CISD teams should be made through the IC.

CISD is an organized approach to supporting emergency service personnel and survivors who are involved in emergency operations under conditions of extreme stress. The purpose of the debriefing is to help mitigate long-term emotional trauma. This model is also known as critical incident stress management.

Critical Incident Stress Defusing is a shorter and less structured version of CISD. "Defusing" usually occurs within a few hours of a critical incident. The main purpose of a defusing is to stabilize the affected personnel so that they can return to work if necessary or go home without unusual stress. Defusings allow for initial venting of reactions to the incident and provides stress related information to affected personnel. A defusing may eliminate the need for a formal CISD or enhance a subsequent CISD.

California Specialized Training Institute, 2019

Investigations

When accidents or injuries occur, legal mandates and departmental procedures require that an investigation be conducted. For example, National Fire Protection Association Standard 1500 requires the investigation of all accidents, fire apparatus collisions, injuries, fatalities, illnesses, and exposures involving members of the fire department. The standard also mandates that corrective action be taken as a result of the investigation to prevent a recurrence of the situation that led to the loss.

Depending on where and when the accident or injury occurs, the incident Safety Officer (SO) or the agency Health and Safety Officer (HSO), or both, will be required to assist in such investigations. (The Assistant Safety Officer-Hazardous Materials plays a limited role.) When these occur during an agency response, the SO may be tasked with beginning the process until relieved by the HSO or other authority.

Why Investigate?

Investigations into the causes of accidents, exposures, deaths, and injuries provides emergency response agencies with information about what went wrong in an accident and the means to avoid that situation in the future. Investigations give us facts about an incident. These facts can provide a basis for correcting our standard operating procedures, developing other control measures to prevent the situation from recurring, and minimizing the negative effects of a recurrence.

Investigations also may uncover trends that cause accidents. A seemingly unrelated series of accidents may have one root cause. The SO may be able to help the HSO determine the cause of most accidents and recommend changes or enhancements that prevent the situation from recurring.

Investigations can also provide legal protection. Response agencies may use their investigations as part of their defense against any civil or criminal claim filed by someone who feels that he or she was injured by an action—or lack of action—by the response agency. Gathering facts and photographs of the incident scene early on will help the response agency determine the course of action it should take, if sued.

What Should Be Investigated?

All accidents, vehicle collisions, exposures, illnesses, injuries and fatalities must be investigated. It also is useful to look into the causes of "near misses." These are accidents that almost happen, such as a brush with death at an intersection, during a response. An estimated 300 near misses occur for every injury. Microseconds can separate a near miss from a tragedy. In contrast to reporting requirements for accidents, near misses usually do not require any paper work. However, the prudent SO will look into near misses. There is no need to wait for an accident to happen to make changes for the better.

Vehicle Collisions

Collisions between an emergency response vehicle and another vehicle or object are one of the most significant and spectacular accidents that emergency response agencies can experience. In fact, aside from the risks at an emergency scene, vehicle collisions are the most significant risks emergency responders face.

California Specialized Training Institute, 2019

Upon arriving at the scene of a vehicle collision, the SO's first concern should be to ensure that anyone who has been injured, responders and civilians alike, have received proper medical care. The SO should ensure that family notifications have been made and that a member of the response agency is available to transport family members to the hospital, if that service is needed or desired. In addition, the SO should ensure that an agency representative is on hand at the hospital to act as a liaison for the employee.

In terms of the investigation, the SO may choose to have minor vehicle collisions documented by a second-level supervisor, such as a battalion chief. In agencies that do not have on-duty supervisors, the SO may need to make arrangements to be available to investigate the collision or to have another member of the agency available for response duties. In any case, the SO should review all collision reports, whether the accident was minor or major.

Vehicle collision analysis is a science and an art. It is best to leave this analysis to those who use these skills on a regular basis. Although the SO should have a basic understanding of vehicle collision analysis, an official from law enforcement usually conducts the actual analysis. In agencies where a significant number of vehicle collisions occur regularly, the SO should become more practiced and educated in the skills of accident investigation.

The SO should be involved the collision analysis in a supporting and observing role. In cases where conflict of interest may arise, as when a city police department investigates a collision involving a city fire truck or ambulance, it may be wise to have a law enforcement official from outside of your government structure perform the analysis. A good working relationship with law enforcement officials will make this process easier.

Photographs of the accident scene should be taken in all cases involving an emergency response vehicle. Use a 35-mm camera to ensure good quality reproductions and enlargements. Prepare a standard report that includes a drawing of the scene and statements from all bystanders and witnesses.

Before being put back into service, all equipment and vehicles should be inspected by a qualified person. If malfunction of equipment, apparatus, or vehicle is suspected of being a factor in a collision, the equipment, apparatus, or vehicle should be impounded. To avoid allegations of impropriety, it is wise to have law enforcement officials do the impounding.

A useful series of articles on accident investigation can be found in *Firehouse* magazine (November 1989 and January 1990). Call the Learning Resource Center at the National Fire Academy for copies of these articles and others concerning accident investigation. The toll-free number is 1-800-638-1821.

Responder Injuries

The SO's first concern upon arriving on the scene is to ensure that all responders have received proper medical care. The SO also is responsible for ensuring that family notifications have been made, that a member of the response agency is available to transport family members to the hospital (if that service is needed or desired), and that an agency representative is on hand at the EMS facility to act as a liaison for the injured responder.

In cases of minor injury, the SO/ASO-HazMat may choose to have the injured responder and his or her immediate supervisor fill out accident and injury forms. In many states, there are strict time limits

California Specialized Training Institute, 2019

between when the injury occurs and when the injury report must be filed with the state department of labor or workers' protection organization.

A qualified technician should inspect any PPE, equipment, or vehicles that may have been involved in an accident *before* they are put back into service. In cases of moderate to severe injury to a responder, the SO should impound all such PPE and equipment until the investigation concludes.

Responder Fatality

The death of a responder is one of the most stressful events an emergency response agency can experience. It is important to know that the Public Safety Officer's Benefit Program has specific documentation requirements that must be completed before it will release any benefits. The International Association of Fire Chiefs (IAFC) has published an excellent guide to the investigation of a firefighter fatality. A copy of this guide should be a part of every fire department's library. The United States Fire Administration (USFA) investigates many firefighter deaths. Copies of past reports are available free of charge from the USFA.

Communicable Disease Exposure

In most situations, the responder who was directly involved will document these exposures. The importance of documenting exposures cannot be understated. This topic is discussed at length in Chapter 8.

Who Should Investigate?

The SO or the ASO-HazMat may be required to begin an investigation and submit reports. However, they should be relieved of this function as soon as possible, as their main focus is the health and safety of incident responders. They should not be distracted from this important task.

In many agencies, the HSO will be the primary investigator in all accidents. In large agencies where the response of a single individual is not reasonable, battalion chiefs or other second-level supervisors should be trained to conduct routine investigations. However, the SO should still review all accident reports. In the event of significant accidents, exposures, or serious injury or death of a responder, the HSO should be directly involved investigations.

The SO may choose to be involved in the investigation of any accident, even those that are considered routine. Other department investigators (such as, arson, environmental, criminal, etc.) who have specialized training in investigative techniques may be called in when the HSO or SO need help with an investigation.

What Happens after the Investigation?

A copy of every accident and exposure report should become part of the agency's permanent file. Health records, such as records of exposure to communicable disease, must be retained with the agency for 30 years after the responder has left employment.

California Specialized Training Institute, 2019

The results and recommendations of every investigation should be passed on to the member of the organization who is responsible for that operation. For example, recommendations concerning changes to the design of fire apparatus should be routed through the chain of command to the agency's apparatus officer.

California Specialized Training Institute, 2019

data and Trend Analysis

As an Assistant Safety Officer-Hazardous Materials (ASO-HazMat), you want to maintain a proactive attitude toward identifying hazards. In other words, you want to identify potential hazards before the incident occurs. Accident reports and incident case studies are excellent sources of generic hazard identification. These resources can help to identify trends or problems that may take years to show up on an individual department level. A summary of online sources follows.

- **Chemical Safety Board (CSB)**
  www.csb.gov/

  The CSB is an independent federal agency charged with investigating industrial chemical accidents. Headquartered in Washington, DC, the agency's board members are appointed by the President and confirmed by the Senate.

  The CSB conducts root-cause investigations of chemical accidents at fixed industrial facilities. Root causes are usually deficiencies in safety management systems, but can be any factor that would have prevented the accident, if that factor had not occurred. Other causes of accident often involve equipment failures, human errors, unforeseen chemical reactions, or other hazards. The agency does not issue fines or citations, but does make recommendations to plants, regulatory agencies (such as the Occupational Safety and Health Administration and the Environmental Protection Agency), industry organizations, and labor groups. Congress designed the CSB to be non-regulatory and independent of other agencies so that its investigations might, where appropriate, review the effectiveness of regulations and regulatory enforcement.

  The CSB investigative staff includes chemical and mechanical engineers, industrial safety experts, and other specialists with experience in the private and public sectors. Many investigators have years of experience in the chemical industry.

- **U.S. Department of Transportation, Office of Hazardous Materials Safety (OHM)**
  http://hazmat.dot.gov/pubs/inc/hmisframe.htm

  The mission of the OHM is to promulgate a national safety program that will minimize the risks to life and property inherent in commercial transportation of hazardous materials. OHM engages in regulatory development, enforcement, training and information dissemination, domestic and international standards, and inter-agency cooperative activities.

- **Agency for Toxic Substances and Disease Registry (ATSDR), Hazardous Substances Emergency Events Surveillance (HSEES)**
  www.atsdr.cdc.gov/HS/HSEES/

  HSEES was established by ATSDR to collect and analyze information about acute releases of hazardous substances and threatened releases that result in a public health action, such as an evacuation. The goal of HSEES is to reduce the morbidity (injury) and mortality (death) to first responders, employees, and the general public as a result of hazardous substances events.

- **NIOSH Fire Fighter Fatality Investigation and Prevention Program**
  www.cdc.gov/niosh/fire/

  Every year approximately 105 firefighters die in the line of duty. To address this continuing national occupational fatality problem, NIOSH conducts independent investigations of firefighter line-of-duty deaths. This Web page provides access to NIOSH investigation reports and other firefighter safety resources.

- **U.S. Fire Administration, Fire Statistics**
  www.usfa.dhs.gov/statistics/

  This page contains statistics on fires that occur in the United States and analytical and topical reports that describe the national fire problem. Also included are statistics related to firefighters and fire departments.

- **National Transportation Safety Board**
  www.ntsb.gov/Publictn/publictn.htm

  The National Transportation Safety Board is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States. It also investigates significant accidents in the other modes of transportation—railroad, highway, marine and pipeline—and issues safety recommendations aimed at preventing future accidents.

- **Occupational Safety and Health Administration (OSHA), Inspection Data**
  www.osha.gov/oshstats/index.html

  This site provides access to OSHA inspection data. Access is available 24 hours a day, seven days a week.

Another excellent source of information on all topics related to emergency services is the Learning Resource Center (LRC) at the National Fire Academy. The LRC is equipped and motivated to help any member of emergency services with research on any topic, free of charge. The LRC can provide copies of relevant articles from magazines and mail them to your home or office. The service may take as long as two weeks, but often as little as a week. Call toll-free 1-800-638-1821.

California Specialized Training Institute, 2019

Incident Planning



Scope

This chapter provides an overview of the common pre-event plans the Assistant Safety Officer-Hazardous Materials should be familiar with and use. This chapter also explores various event-specific and site-specific plans and discusses the components of formal incident termination.



Terminal Learning Objective (TLO)

At end of instruction for Chapter 5, participants will be able to assist in the preparation and development of components for event-specific and site-specific plans that involve personnel safety.



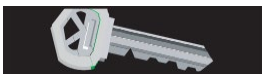
Enabling Learning Objectives (ELOs)

This chapter's enabling learning objectives are to ensure participants will be able to:

1. Describe common pre-event plans the Assistant Safety Officer-Hazardous Materials should be familiar with and use.
2. Explain the role of the Assistant Safety Officer-Hazardous Materials in developing various event-specific plans.
3. Develop personnel safety components for a Site Safety Plan.
4. Use the ICS Form 214 as a tool for recording incident events and as the foundation for all aspects of formally terminating an incident.

Supporting Materials/resource List

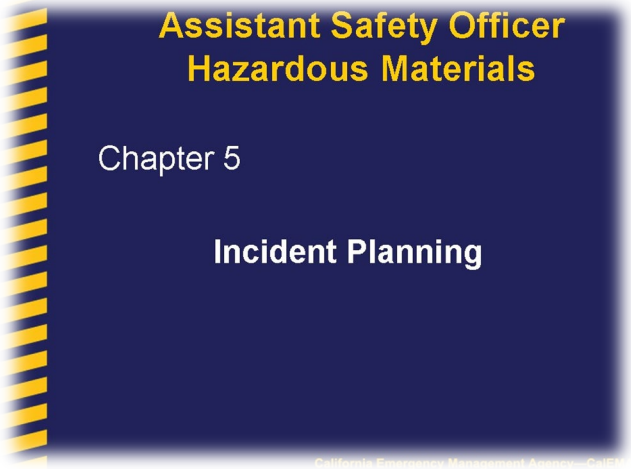
See Supporting Materials/Resource List section starting on page 231.



Practical Exercises

Note: No exercises are scheduled for this chapter.

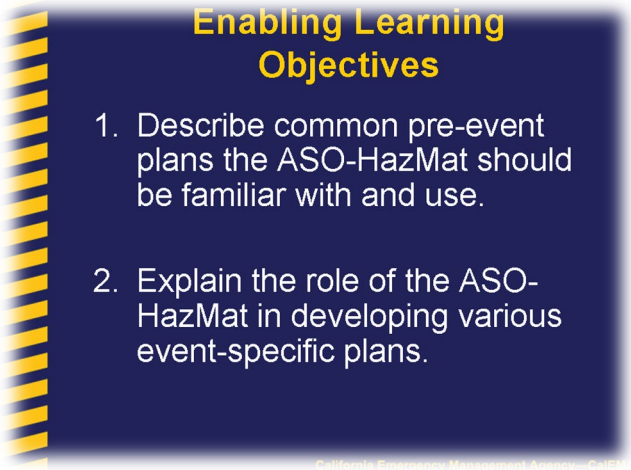
California Specialized Training Institute, 2019



Slide 5.1

The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

- (Res.B.2 1.3) Develop plans, procedures, and protocols for public safety and security support activities.
- (Res.B.2 5.4) Ensure the safety of all on-scene responders.



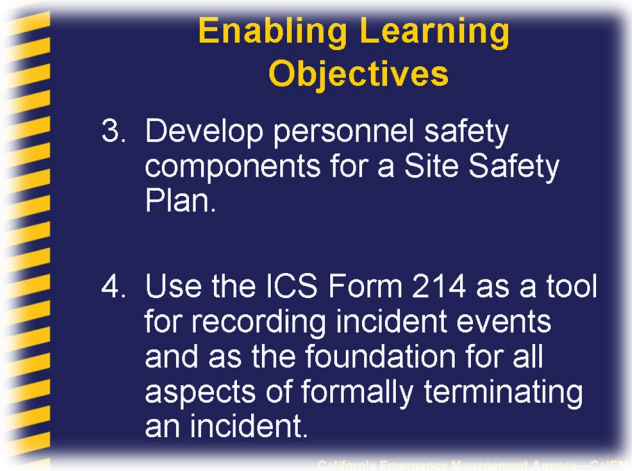
Slide 5.2

The goal (terminal learning objective) of this chapter is to ensure that participants will be able to assist in the preparation and development of components for event-specific and site-specific plans that involve personnel safety.

This chapter's enabling learning objectives are to ensure participants will be able to:

1. Describe common pre-event plans the Assistant Safety Officer-Hazardous Materials should be familiar with and use.
2. Explain the role of the Assistant Safety Officer-Hazardous Materials in developing various event-specific plans.

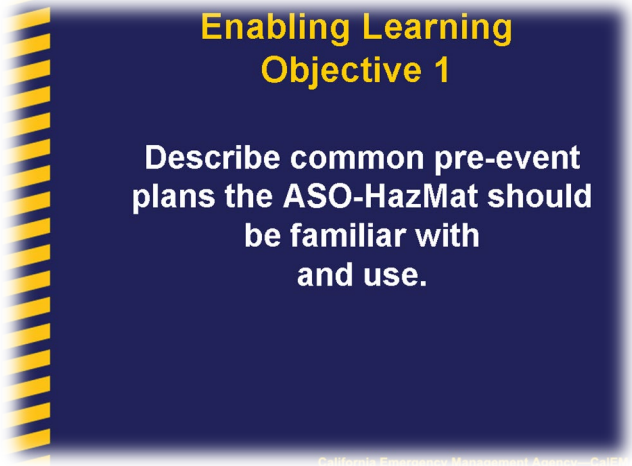
California Specialized Training Institute, 2019



Slide 5.3

This chapter's enabling learning objectives will also ensure participants will be able to:

3. Develop personnel safety components for a site safety plan.
4. Use the ICS Form 214 as a tool for recording incident events and as the foundation for all aspects of formally terminating an incident.



Slide 5.4



Slide 5.5

An effective response is the result of good planning. As one military adage puts it: The plan is nothing. To plan is everything!

Incident outcomes are only as good as the input that goes into them. This applies to the planning process that occurs *before* the incident and to the planning process that occurs *during* the incident. The documents that result from those planning processes—pre-event and event-specific plans—guide the actions of responders in safely and effectively mitigating the incident.

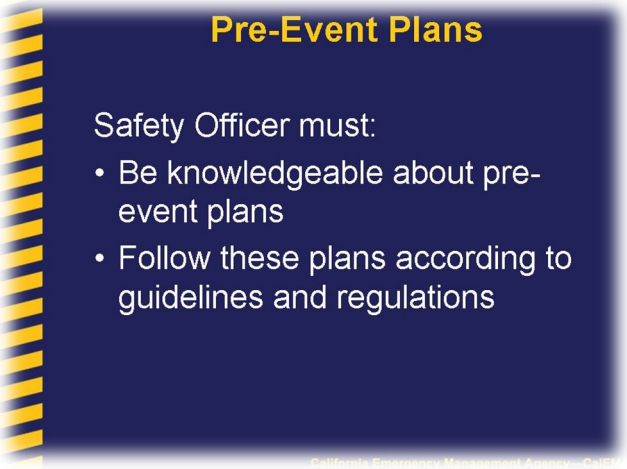


Slide 5.6

As the term implies, pre-event planning takes place before an incident happens. Pre-event planning has the significant advantage of allowing responders to prepare for an event under tranquil conditions.

Pre-event plans are developed at all levels of government and private industry. They are typically developed by committees representing every aspect of incident involvement, such as state emergency response commissions and local emergency planning committees.

Event-specific plans are developed to address the needs and concerns of each particular incident as it occurs. Examples of event-specific plans that involve the safety official include the communications plan, Incident Action Plan, and the medical plan, all of which we will discuss in greater detail later in this presentation.

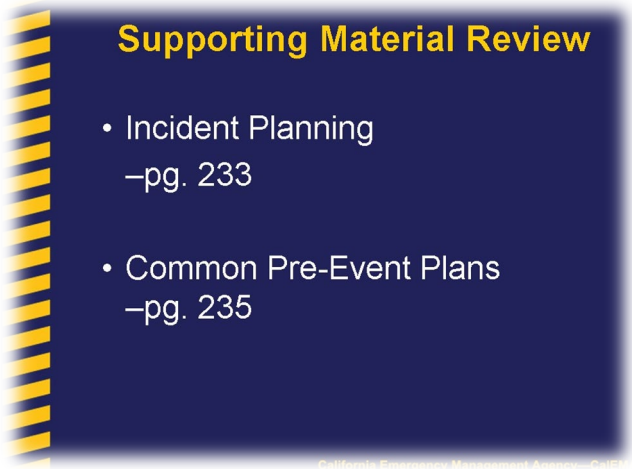


Slide 5.7

Pre-event planning involves clearly defining capabilities, roles, and responsibilities. It also addresses the interrelationships among emergency response organizations. Pre-event plans identify problems and resources, organize resources, and develop planning goals in advance of the incident's occurrence.

Safety Officers must be knowledgeable about and follow pre-event plans according to guidelines and regulations. The requirement to know and use these plans is found in both Environmental Protection Agency and Occupational Safety and Health Administration (OSHA) regulations.

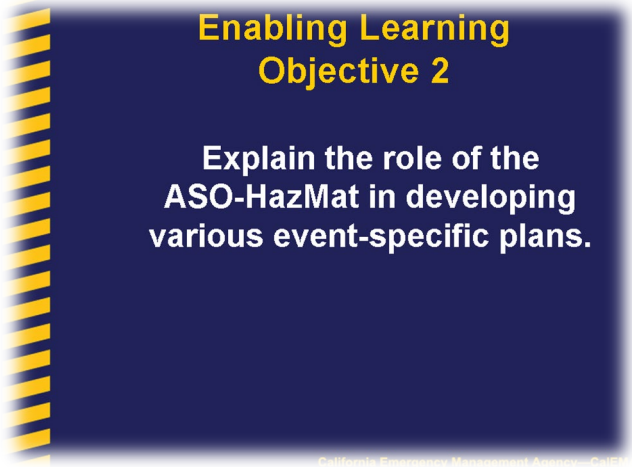
California Specialized Training Institute, 2019



Slide 5.8

Review the listed supporting materials in the participant guide, pages 233 and 235.

The section on pre-event plans describes many of the essential plans that an effective Safety Officer and Assistant Safety Officer-Hazardous Materials should be familiar with and use.



Slide 5.9



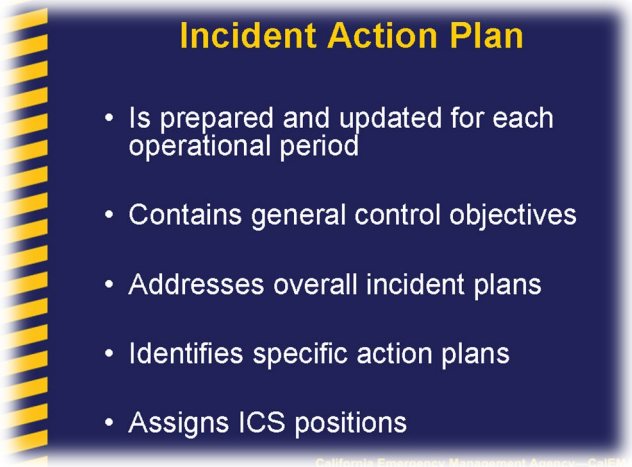
Slide 5.10

It is the Safety Officer's function to:

- Participate in the incident planning process
- Produce, review, and approve of elements in plans that pertain to personnel safety
- Help ensure that plans' components are followed

The next several slides address various event-specific plans that involve the Safety Officer.

California Specialized Training Institute, 2019

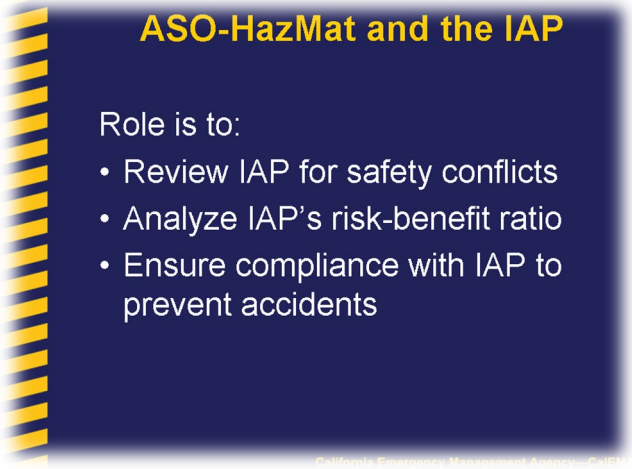


Slide 5.11

The Incident Commander (IC) and the command and general staff, if activated, are responsible for developing the Incident Action Plan, or IAP.

Preparation of the IAP begins at the first meeting. The IAP provides clear hazard assessment and identifies reasonable operational periods. It contains general control objectives that reflect the overall incident strategy. The IAP also identifies specific action plans for the next operational period. It includes a general safety message and assigns ICS positions.

The plan is a compilation of various ICS forms and other documents pertinent to the particular incident. These other documents may include weather briefings, safety messages, traffic plans, evacuation plans, exposure protection plans, or other information.



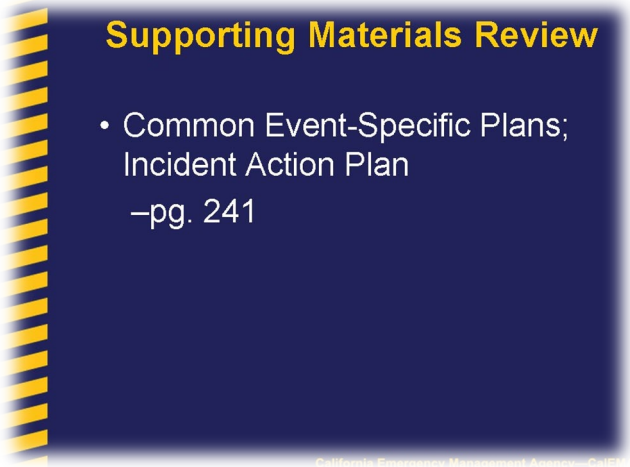
Slide 5.12

Safety Officers play an important role in developing the IAP. They must review the IAP for safety conflicts. These conflicts may occur between incident objectives, management organization, division/group resources and tactics, and personnel safety.

Safety Officers analyze risk-benefit ratios and suggest modifications to the IAP during the planning process—not after the plan has been issued to the field.

Many accidents and near misses to personnel in the Operations Section occur as a direct result of failure to comply with elements of the IAP.

California Specialized Training Institute, 2019



Slide 5.13

Review the listed supporting materials in the participant guide, page 241.

The IAP may include any of the ICS forms. However, the IAP typically incorporates the following ICS forms:

- 201 (Incident Briefing)
- 202 (Incident Objectives)
- 203 (Organization Assignment List)
- 204 (Division Assignment List)
- 205 (Incident Radio Communications Plan)
- 206 (Medical Plan)
- 209 (Incident Status Summary)

Note that ICS forms 205 and 206 will be addressed in other sections of this chapter.



Slide 5.14

The communications plan is designed to coordinate the available communications devices among incident responders, based upon need and priority.

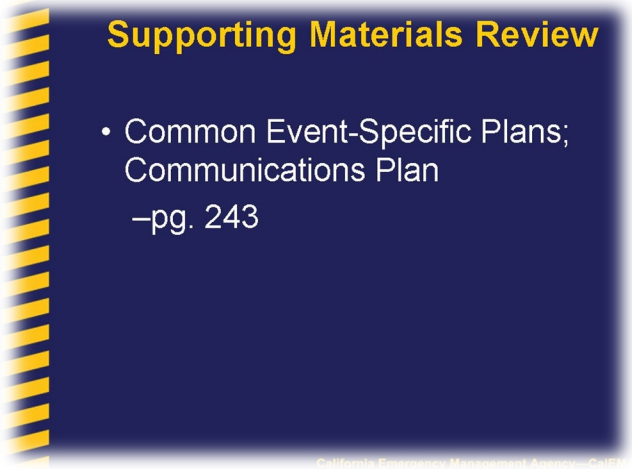
These devices may include radio frequencies, relay repeaters, telephones, cell phones, computer modems, FAX machines, and other communications resources.

California Specialized Training Institute, 2019



Slide 5.15

The Logistics Section Chief or the Communications Unit Leader, if activated, is responsible for developing the communications plan. The plan is incorporated into the Incident Action Plan through the use of ICS Form 205.



Slide 5.16

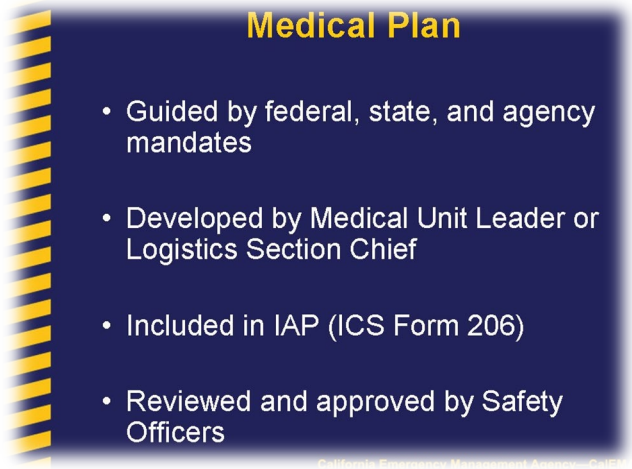
Review the listed supporting materials in the participant guide, page 243.

Note that Safety Officers must review the communications plan to ensure that clear lines of communication exist between all incident responders within their area of responsibility.

Specific attention should be given to monitoring by assigned safety officials and to lines of communications between:

- Subordinates and supervisors
- Supervisors and emergency medical services and transports
- Aircraft and their controllers
- Hazardous materials Entry Teams and their supervisors

California Specialized Training Institute, 2019

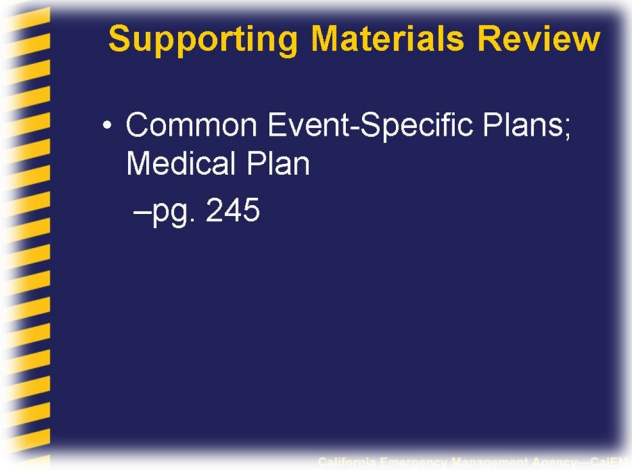


Slide 5.17

Although some types of incidents do not require medical services stand-by, federal and state mandates do require on-scene medical services personnel for some types of incidents. Incident safety officials must be familiar with regulatory and agency minimums for onsite medical services.

The purpose of the medical plan is to provide emergency medical services at the incident.

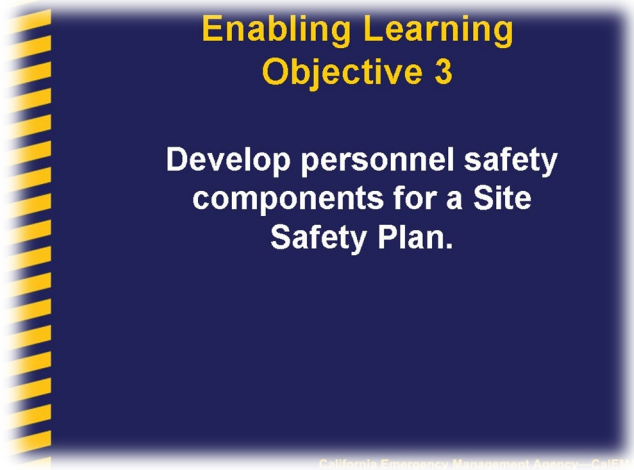
Safety Officers are responsible for reviewing and approving the medical plan. Safety Officers must scrutinize the document to determine if the appropriate resources are on hand or available to deal effectively with any anticipated accidents or injuries. Safety Officers should suggest modifications to the medical plan during the planning process.



Slide 5.18

Review the listed supporting materials in the participant guide, page 245.

The medical plan also serves as a checklist for various considerations, such as basic life support, advanced life support, paramedics, ambulance services, medical evacuation aircraft, burn centers, emergency contact numbers, and special precautions.



Slide 5.19



Slide 5.20

The purpose of the site safety plan is to ensure the safety of onsite personnel, establish standard operating procedures, establish a command structure, and provide a briefing document that provides responders with the incident's objectives, plans, and contingencies.

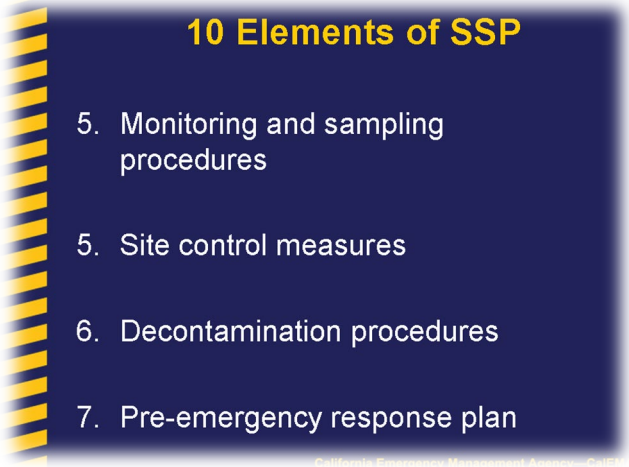
The site safety plan is identified in the Code of Federal Regulations Title 29, 1910.120. The phrase "site safety plan" has become almost universal in describing any document that details the elements necessary to safely mitigate a hazardous materials incident.



Slide 5.21

Managers must address ten elements for worker safety in a site safety plan. As required under 29 CFR 1910.120, these elements include:

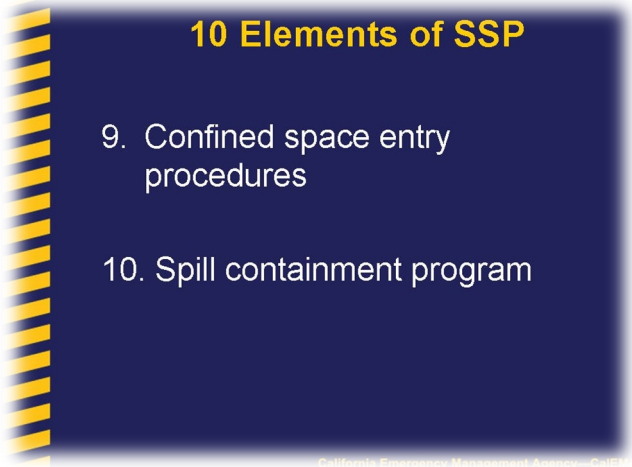
1. Safety, health and hazard risk analysis (including entry objectives)
2. Site organization (including training and qualifications)
3. Proper personnel protective equipment (identifying exact type and material)
4. Medical monitoring procedures



Slide 5.22

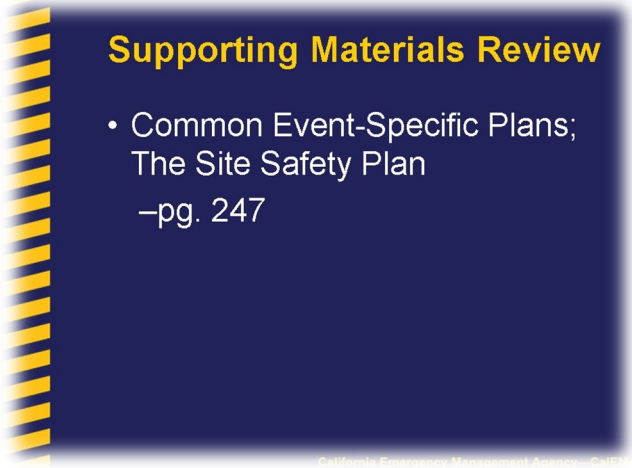
5. Monitoring and sampling procedures
6. Site control measures (including control zone locations)
7. Decontamination procedures
8. Pre-emergency response plan (including entry, fire, and medical)

California Specialized Training Institute, 2019



Slide 5.23

9. Confined space entry procedures (including backup and escape plans)
10. Spill containment program (drum/container handling)



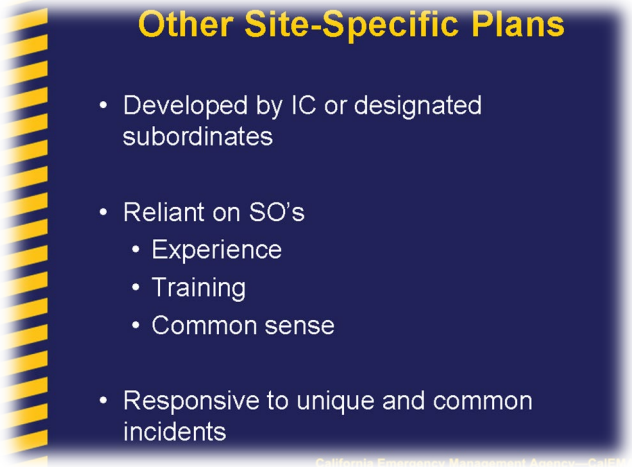
Slide 5.24

Review the listed supporting materials in the participant guide, page 247.

Poor management, lack of planning, and the failure to comply with nationally recognized practices are common problems that have been associated with hazardous materials incidents. By conducting a thorough site safety evaluation, all aspects of personnel safety, including the management structure, will be properly addressed.

One of the best ways to develop a site safety plan is to start with a standardized form, template, or checklist to focus on the elements necessary to ensure worker safety.

California Specialized Training Institute, 2019



Slide 5.25

Safety officials must use their experience, training, and common sense to develop the plans and checklists they need to perform these tasks. Many agencies have already developed their own set of event-specific forms and checklists to help ensure safe incident mitigation. Networking with those agencies will provide excellent examples for your agency if it needs to develop its own event-specific forms, checklists, and guidelines.

Each incident presents both similar and unique safety issues. Common issues include the often overlooked safety of personnel while off the incident—such as safety while in base, camp, or other locations. Plans and checklists to address these potential safety issues already exist throughout the emergency response community. They deal with subjects such as rest and rehabilitation, sanitation, security, parking, vehicle maintenance and repair, power, fueling, and feeding.

The unique issues typically involve site weather, topography, access and egress, or other singular questions.

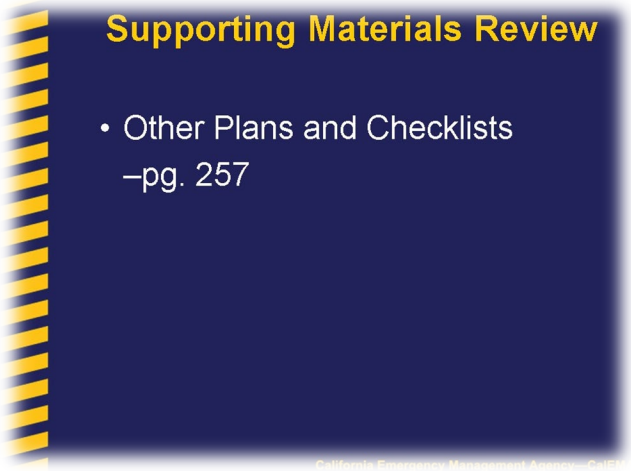


Slide 5.26

These plans typically deal with single-subject emergencies or facets of an incident that are peculiar to them. For example, common event-specific plans deal with response procedures for flood, earthquake, and urban search and rescue.

Components of these plans address strategies, tactics, safety, resource allocation, and other subjects. These plans do not have ICS forms. Instead, agencies generate forms or checklists to address specific needs.

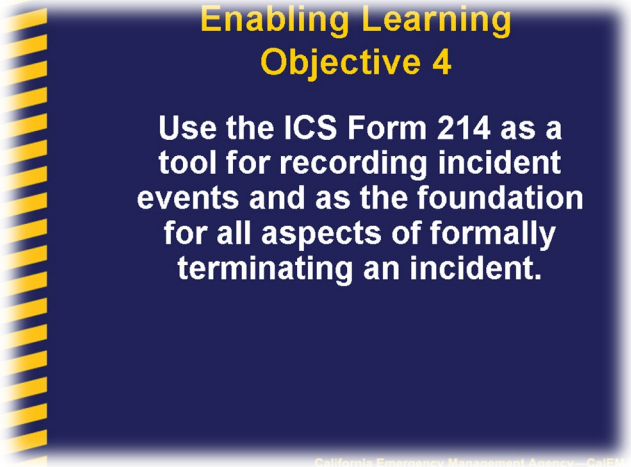
California Specialized Training Institute, 2019



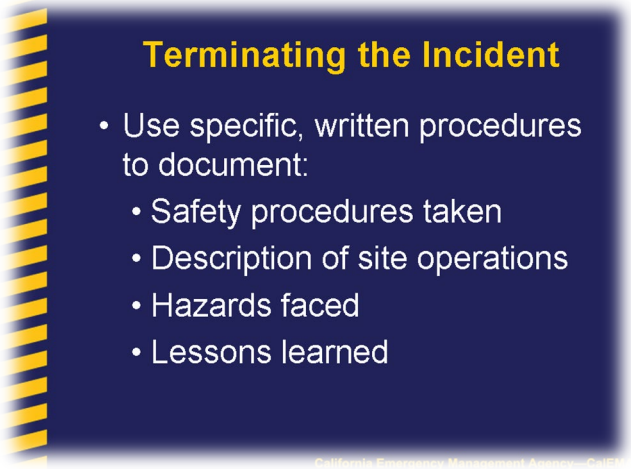
Slide 5.27

Review the listed supporting materials in the participant guide, page 257.

This section includes a sample checklist on safety reminders for fire operations.



Slide 5.28



Slide 5.29

Once the final clearance has been issued by the responsible health agency or other designated party, it is important that each hazardous materials incident be formally terminated through specific written procedures.

This documentation process should include:

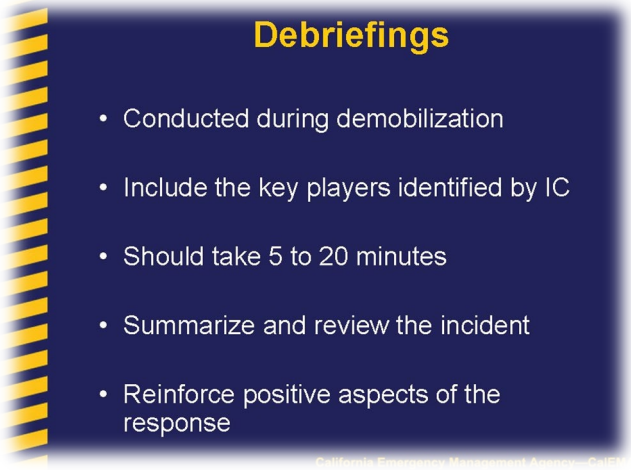
- Safety procedures taken
- Description of the site operations
- Hazards faced
- Lessons learned during the incident

California Specialized Training Institute, 2019



Slide 5.30

The documentation also provides a record of the information and data that may be required in order to comply with local, state, and federal laws. Incident termination procedures help to prepare the agency and its personnel for potential litigation that may arise from the incident.



Slide 5.31

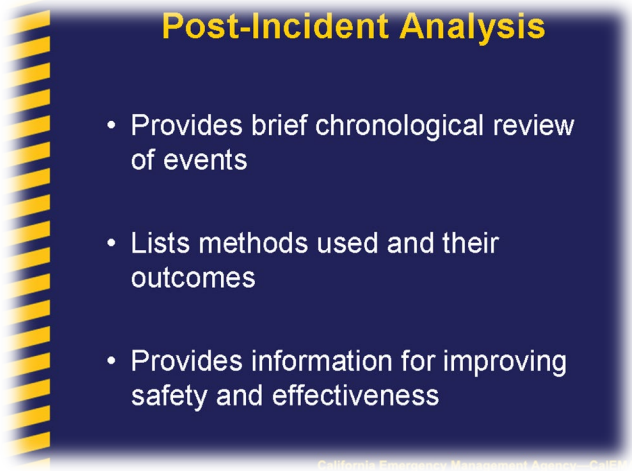
A debriefing should occur during demobilization as soon as the "emergency" phase of the operation is completed, and, if possible, before first responders leave the scene.

Debriefing should include the initial responders, hazardous materials response teams, decontamination teams, EMS workers, command and general staff, division or group supervisors, agency representatives, and other key players as specified by the Incident Commander.

An effective debriefing should last no more than 5 to 20 minutes, depending on complexity, and should:

- Inform responders of the hazards they were possibly exposed to, explain signs and symptoms, and what procedures are to be taken if signs/symptoms develop at a later time.
- Identify equipment damage and unsafe conditions that require immediate attention or isolation for further evaluation.
- Assign information-gathering responsibilities for a post-incident analysis and critique.
- Summarize the activities performed by the various divisions or groups.
- Reinforce positive aspects of the response. This is an appropriate time to say, "Thanks for taking on a difficult job. Well done!"

California Specialized Training Institute, 2019

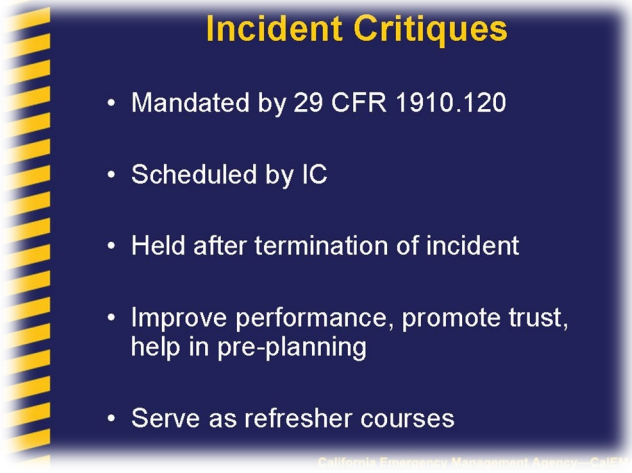


Slide 5.32

Most agencies require some form of after-action report following an incident. This report may be known as a Post-Incident Analysis (PIA), manager's report, after-action report, or some other name. This report may serve several purposes, such as providing internal review of agency actions and policies, investigating accidents and injuries, conducting statistical analyses, assessing training and equipment needs, and determining compliance and enforcement.

The PIA is a reconstruction of an incident to assess the chain of events that took place, the methods used to control the incident, and how the actions of emergency response personnel contributed to the eventual outcome. The PIA is assigned to a member of the General Staff or Command Staff. The PIA should be started as soon as possible after the emergency phase of the incident.

The main purpose of the PIA is to reinforce effective personnel actions and departmental procedures and to provide information that will help management improve the effectiveness of the department's operations.



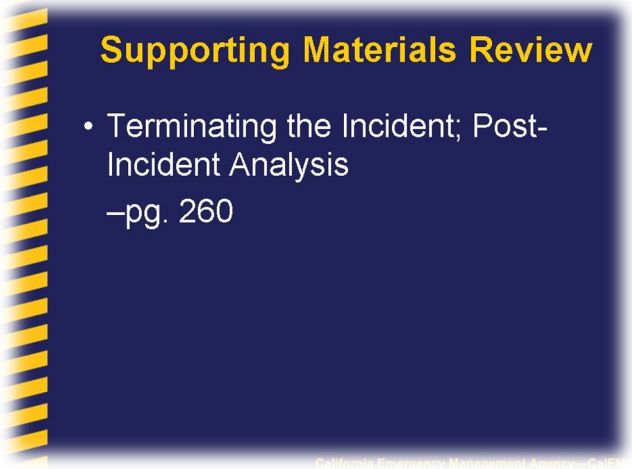
Slide 5.33

Critiques for major and catastrophic hazardous materials incidents are mandated by the Final Rule of 29 CFR 1910.120. The Incident Commander is responsible for scheduling and organizing the critique. Critiques should be held after the incident has been completely terminated and information has been gathered and analyzed.

Effective critiquing sessions are a positive way to outline lessons learned and should be designed to improve responder performance by increasing efficiency and pinpointing weaknesses. A good critique promotes trust in the response system as being a self-correcting operational unit, and helps in pre-planning for future significant incidents. It is also a time for sharing information between response agencies.

The critique also is a valid and important training tool. In fact, OSHA, under 29 CFR 1910, has even suggested that critiques of emergency response performance can adequately serve as a means of satisfying the mandated refresher training requirements for employees. OSHA's rationale is that employees who have actual knowledge of the acceptable and non-acceptable actions that took place during a response will be able to perform in a more appropriate manner during the next emergency response.

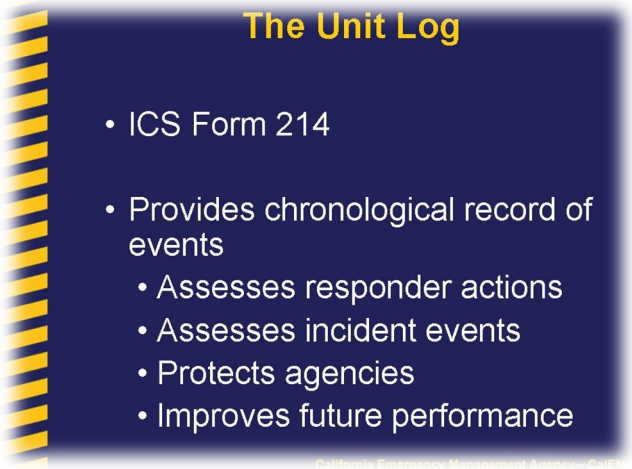
California Specialized Training Institute, 2019



Slide 5.34

Review the listed supporting materials in the participant guide, page 260.

Examine the Sample PIA.



Slide 5.35

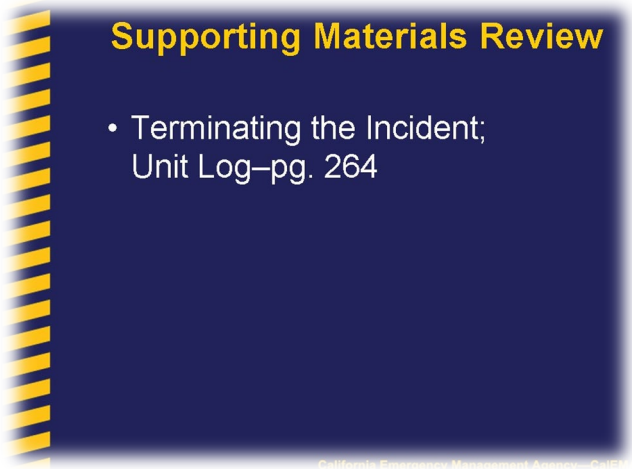
Responders, managers, and safety officials should be completely familiar with and know how to use the ICS Form 214 (Unit Log).

Properly completed, this important document provides a chronological recording of events within each Incident Command System function and position.

The Unit Log is a valuable tool for assessing responders' actions and events at the incident, providing protection for the agency, and improving future performance. Unfortunately, this document routinely is filled out too late, after the fact, poorly, or not at all.

Development of the Unit Log is the responsibility of each individual who has assigned responsibilities and a title within the ICS. However, SOs are responsible for their own records and for their subordinates' records as well.

California Specialized Training Institute, 2019



Slide 5.36

Review the listed supporting materials in the participant guide, page 264.

Remember the Unit Log is an important tool for recording significant incident events and can serve as the foundation for formally documenting incident termination.

Safety officials are responsible for ensuring that their (and that of their immediate subordinates) documentation of events occurring within their responsibilities is thorough. These events may include facility and operational area inspections, reports and investigations of accidents or injuries, personnel arrivals and departures, and any other pertinent information.



Slide 5.37

Incident plans can be complex and confusing. It is the safety official's task to sift through all of the information and determine if the objectives and tactics can be safely accomplished with the resources that are available. For example, are the correct number of personnel with the proper training and equipment present? Are the objectives reasonable and achievable within the time specified?

Understanding the planning process and learning to fully use the information contained within agency documents will go a long way toward answering those questions and achieving a safe outcome.

Keep in mind that the ASO-HazMat's duties do not end with termination of the incident. Everyone has a right to know what hazards he or she has faced and how to prevent exposures from occurring in the future. Make sure that your job does not end until all of the lessons have been learned and shared with others.

California Specialized Training Institute, 2019

Chapter 5



Supporting Materials/ Resource List

Incident Planning

An effective response is the result of good planning. As one military adage puts it: The plan is nothing. To plan is everything! Incident outcomes are only as good as the input that goes into them. This applies to the planning process that occurs *before* the incident and to the planning process that occurs *during* the incident. The documents that result from those planning processes—pre-event and event-specific plans—guide the actions of responders in safely and effectively mitigating the incident.

Pre-Event Planning

As the term implies, pre-event planning takes place before an incident happens. Pre-event planning involves clearly defining capabilities, roles, and responsibilities. It also addresses the interrelationships among emergency response organizations. Some pre-event plans include standard operating procedures and response resources, such as material and personnel. Pre-event plans are developed at all levels of government and private industry. Pre-event plans typically are developed by the committees that are involved in every aspect of incident response, such as state emergency response commissions and local emergency planning groups. The Safety Officer (SO) is responsible for producing, reviewing, or approving elements of pre-event plans that pertain to personnel safety.

Benefits of Pre-Event Planning

Pre-event planning has the significant advantage of allowing responders to prepare for an event under tranquil conditions. Pre-event planning also allows responders to:

1. Analyze hazards, risks, and vulnerabilities *before* an incident occurs to determine at-risk locations and populations.
2. Determine available incident resources, such as personnel, equipment, and training.
3. Assign agency and individual response roles and responsibilities.
4. Prepare incident facilities, such as shelters, emergency operation centers, and bases.
5. Determine egress and evacuation routes and requirements.
6. Determine incident communications needs.
7. Determine community emergency shortcomings and incident needs.

Examples of pre-event emergency response plans include business plans (private sector), area plans (local level), hazardous materials contingency plans (state level), and contingency plans for oil and hazardous substance pollution (federal level). This chapter will discuss these and many other pre-event plans the Assistant Safety Officer-Hazardous Materials (ASO-HazMat) and other safety officials should be familiar with and use.

California Specialized Training Institute, 2019

Event-Specific Plans

Incident plans can be complex and confusing. It is the safety official's task to sift through all of the information and determine if the objectives and tactics can be safely accomplished with the available resources. Are the correct number of personnel with the proper training and equipment present? Are the objectives reasonable and achievable within the time specified?

Fortunately, agencies have plans and documents to help the ASO-HazMat answer these questions and achieve a safe outcome. These plans and documents fall under the category of event-specific plans. Examples of these plans include the communications plan, the Incident Action Plan, and the demobilization plan. This chapter will discuss these and many other event-specific plans the ASO-HazMat and other safety officials should be familiar with and use.

California Specialized Training Institute, 2019

Common Pre-Event Plans

The purpose of pre-event plans is to identify problems, identify resources, organize resources, and develop planning goals in advance of the incident's occurrence. The requirement to know and use these plans is addressed in both Environmental Protection Agency and Occupational Safety and Health Administration regulations. The section that follows describes some of the pre-event plans in which the effective SO and Assistant Safety Officer-Hazardous Materials (ASO-HazMat) should be well-versed and able to use.

Private Sector Plans

- **Business Plan:** California's Hazardous Materials Emergency Planning and Community Right-to-Know (EPCRA) program requires all businesses, unless specifically exempted, that handle hazardous materials in excess of threshold planning quantities to provide a business plan. This plan includes extensive inventory information of chemical name, composition, characteristics, and location; emergency contact personnel, emergency response, and evacuation and notification procedures; training; and other issues related to the release or threatened release of hazardous materials. One hundred and twenty-seven administering agencies oversee this program in California. Further information is available from the Office of Emergency Services, Hazardous Materials Division, at (916) 427-4287.
- **Standard Operating Procedures and Standard Operation Guidelines (SOPs and SOGs):** SOPs and SOGs are detailed delineations of specific actions to be taken during an emergency, such as the release or threatened release of hazardous materials. The SOP may be part of the business plan or may be a separate document.
- **Risk Management and Prevention Programs (RMPP):** Firms that handle extremely hazardous materials in excess of federal threshold planning quantities may be required by the local administering agency to prepare an RMPP for the facility. The RMPP may entail the sum total of programs for the purpose of minimizing acutely hazardous material accident risks. The RMPP may address topics such as system safety design review for equipment, safety evaluation of work practices, system and element reliability, preventative maintenance procedures, risk assessment for specific equipment, emergency response planning, and internal or external auditing procedures.
- **Hazardous Waste Facilities Emergency Plans:** Every hazardous waste facility must prepare a contingency plan. This plan describes the actions the facility must take in response to emergencies and actions to minimize the impact of a release of hazardous waste. Hazardous Waste Facilities Emergency Plans are required under the Resource Conservation and Recovery Act, 40 CFR Part 264, and Sections 67104 and 67141, et seq., of the California Code of Regulations.

Local Government Plans

- **Area Plan:** Also known as a Hazardous Materials Incident Contingency Plan, this plan addresses the emergency response to a release or threatened release of a hazardous material. This plan must include procedures and protocols for emergency personnel, pre-emergency planning, notification and coordination, training, public information, equipment, accessing contractors, incident critique, submission of California Hazardous Material Incident Reporting System reports, onsite inspections, and a data

California Specialized Training Institute, 2019

management system. This may be a stand-alone plan or part of the agency's multi-hazard function plan. The administering agencies that implement hazardous materials emergency planning and community right-to-know programs are required, pursuant to Chapter 6.95 of the California Health and Safety Code, to prepare this plan for their jurisdictions.

- **Standard Operating Procedures and Standard Operating Guidelines:** Many departments will have internal plans that clearly define actions to be taken in the event of a hazardous materials incident. (Refer to SOPs under private sector planning).
- **Emergency Medical Services Plan (EMS):** A jurisdiction that has an EMS agency is required to have an EMS plan that addresses hazardous materials and mass casualties that could result from those hazardous materials.
- **All-Hazards Plan:** In California, this plan is known as the Multi-Hazard Function Plan (MHFP). Two documents provide guidance for communities in developing a "basic emergency plan" and incorporating a team and functionality approach to all-hazards emergency planning. These documents are the Civil Preparedness Guide 1 – 8 (Guide for the Development of State and Local Emergency Operations Plans) and the State and Local Guide 101 (Guide for All-Hazard Emergency Operations Planning).

  The general format of the MHFP consists of a basic plan (Part One) with enclosures for authorities and references, hazard mitigation, mutual aid, continuity of government, and a glossary of terms. An appendix, which identifies hazards the community needs to prepare for, completes the basic plan. At the heart of the plan is a basic functional/agency matrix that identifies all agencies with functional responsibilities. This matrix may be modified for hazard-specific threats and included in Annex A (Managing Emergency Operations). This general format for emergency plans has helped clarify emergency response duties when agencies that have a range of capabilities must work together to maximize efforts to save life and property.

  Under the current guidance, the functional annexes in Part Two of the MHFP include:

  - Annex A: Managing Emergency Operations
  - Annex B: Fire and Rescue Operations
  - Annex C: Law Enforcement and Traffic Control Operations
  - Annex D: Medical Operations
  - Annex E: Public Health Operations
  - Annex F: Coroner Operations
  - Annex G: Care and Shelter Operations
  - Annex H: Evacuation Operations
  - Annex I: Rescue Operations
  - Annex J: Construction and Engineering Operations
  - Annex K: Resources and Support Operations
  - Annex R: Radiological Protection

California Specialized Training Institute, 2019

Appendices to the annexes address hazard-specific threat contingencies. They also contain checklists of actions that should be taken in response to the threat posed by each hazard. These threats generally include, but are not limited to:

- Earthquakes
- Hazardous material incidents
- Floods
- Dam failures
- Terrorism/weapons of mass destruction
- National security emergencies

Note: In some communities, the area plan is incorporated into the hazardous materials portion of the MHFP. In other jurisdictions, the threats from hazardous materials address only long-term or prolonged incidents that may involve issues of care and shelter and/or public health concerns.

Part Three of the MHFP consists of supporting documents that include desired operational data.

- **County Hazardous Waste Management Plans (CoHWMP):** Also known as County Tanner Plans, these plans address hazardous waste generation within a county and how the waste will be minimized, reduced, recycled, treated, stored, or disposed of. CoHWMPs also establish citing criteria for hazardous waste facilities and should include activities for emergency mitigation, preparedness, and response in regard to hazardous wastes. CoHWMPs are developed pursuant to Assembly Bill 2948.

regional Plans

- **SARA Title III Regional Plans:** These plans are developed to comply with title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986. SARA plans build on a local government's area plans for implementing the state hazardous materials emergency planning and community right-to-know programs. SARA plans address regional mutual aid, hazardous material transportation issues, hazards analysis, and coordination of incidents that cross jurisdictional boundaries. In California, the six mutual aid regions designated by the state's Office of Emergency Services provide the geographical basis for SARA plans.
- **Regional Hazardous Waste Management Plans:** These plans are being developed to address hazardous waste management on a regional level. The Association of Bay Area Governments, the Association of Monterey Bay Area Governments, and the Southern California Association of Governments are coordinating development of these plans.
- **Catastrophic Earthquake Response Plans:** These plans were developed by the Bay Area Earthquake Preparedness Project and the Southern California Earthquake Preparedness Project to address the regional response to catastrophic earthquakes for the San Francisco Bay Area. Hazardous materials incidents associated with the earthquake are addressed in the plan's Fire, Rescue, and Toxics sections.

California Specialized Training Institute, 2019

Statewide Planning

- **California State Emergency Plan:** The state plan addresses California's response to emergencies requiring some level of state activity, including extraordinary natural, technological (including hazardous materials), and war-related hazards. The Emergency Plan is written in a multi-hazard functional format so that it is compatible with the multi-hazard function plans developed by local government. It provides a framework for specific response plans, such as the Hazardous Materials Incident Contingency Plan or regional earthquake plans, and for agency-specific response plans and procedures.
- **California Hazardous Material Incident Contingency Plan (HMICP):** The HMICP is the state's toxic disaster plan. This plan is authorized by Section 8574.17 of the California Government Code.
- **California Oil Spill Contingency Plan (The Oil Spill Contingency Plan):** This stand-alone annex to the HMICP promotes an effective response to oil spills. The Oil Spill Contingency Plan is developed by the State Interagency Oil Spill Committee, pursuant to Sections 8574.1 and 8574.7 of the California Government Code, and chaired by the Department of Fish and Game.
- **California Hazardous Waste Management Plan:** This plan is the culmination of local and regional hazardous waste management planning. The Hazardous Waste Management Plan addresses the total hazardous waste generated in California and how best to minimize, recycle, treat, store, and dispose of the waste. Facility citing and emergency response are addressed in the Hazardous Waste Management Plan, which is developed pursuant to Assembly Bill 650.
- **California Hazardous Waste Capacity Assurance Document:** Under this plan, California is required to show the federal government that the state has the capability to manage all of its hazardous waste for a 20-year period. This plan is developed pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Section 102 (c) (9).
- **California Terrorism Response Plan:** Also known as the CTRP, this plan addresses response to weapons of mass destruction (WMD). The plan provides direction on preparing for and responding to terrorist events to California state agencies and local governments involved in protecting public safety. The plan serves as reference information for federal agencies. This plan also clarifies the roles and relationships of state and federal governments in dealing with the threat, or actual occurrence, of terrorist events in California. The WMD response plan is developed under the Emergency Services Act, California Government Code §8570(j).

Federal Planning

- **Region IX—Mainland Oil and Hazardous Substance Pollution Contingency Plan (RCP)** and the **Supplement to the Region IX Contingency Plan for the Colorado River:** Also known as the Regional Contingency Plan or the RCP, the purpose of this plan is to coordinate timely, effective responses by various federal agencies and other organizations to discharges of oil and releases of hazardous substances, pollutants, and contaminants in order to protect public health and welfare and the environment [NCP, 300.42 (a)]. Both plans are part of the Federal Response Plan (Public Law 93-288).

California Specialized Training Institute, 2019

This plan includes information on CERCLA (Superfund) remedial response actions. However, the primary purpose of the plan is to provide guidance for emergency response and removal under provisions of the Clean Water Act (CWA), for response actions under CERCLA, and for regional contingency planning under provisions of SARA. The RCP articulates the division of responsibilities among federal, state, and local governments from the federal perspective in response actions; procedures for establishing federal local contingency plans, and procedures for undertaking response actions in accordance with the CWA and CERCLA.

- **Federal Radiological Emergency Response Plan (FRERP):** This plan serves as the basis for federal agencies' response plans (in addition to agency-specific policies) and is to be used by federal agencies in peacetime radiological emergencies. It primarily concerns the off-site federal response in support of state and local governments with jurisdiction for the emergency. The FRERP defines the federal government's concept of operations based on specific authorities for responding to radiological emergencies and outlines federal policies and planning assumptions that underlie this concept of operations. The FRERP also specifies the authorities and responsibilities of each federal agency that may have a significant role in such emergencies. Federal agencies with radiological monitoring and assessment capabilities will use the Federal Monitoring and Assessment Plan, which is included in the FRERP. The FRERP was developed pursuant to Public Law 96-295, June 30, 1980, Section 304.
- **Federal Response to a Catastrophic Earthquake:** This plan describes the organization of the federal government in the event of a catastrophic earthquake on a national level and for FEMA Region IX.
- **Marine Safety Sectors "Oil and Hazardous Substance Federal Pollution Contingency Plan:"** (Appendix B of 40 CFR part 300): Each Coast Guard zone has developed a specific plan that describes policies, responsibilities, and procedures for on-scene response. This plan is designed to be used in conjunction with the national, regional, state, and other local contingency plans.
- **Terrorism Incident Annex to the Federal Response Plan (PDD 39):** This plan defines policies regarding the federal response to threats or acts of terrorism involving nuclear, biological, and/or chemical material, and/or weapons of mass destruction (NBC/WMD). PDD-39 directs federal departments and agencies to conduct specific activities that may affect the performance of their responsibilities under the FRP.

  PDD-39 includes a number of measures to reduce the nation's vulnerability to terrorism, to deter and respond to terrorist acts, and to strengthen capabilities to prevent and manage the consequences of terrorist use of NBC, including WMD. PDD-39 discusses crisis management and consequence management.

  Under PDD-39, crisis management includes measures to identify, acquire, and plan the use of resources needed to anticipate, prevent, and/or resolve a threat or act of terrorism. The laws of the United States assign primary authority to the federal government to prevent and respond to acts of terrorism; state and local governments provide assistance as required. Crisis management is predominantly a law enforcement response. Based on the situation, a federal crisis management response may be supported by technical operations, and by federal consequence management, which may operate concurrently.

Similarly, consequence management includes measures to protect public health and safety, restore essential government services, and provide emergency relief to governments, businesses, and individuals affected by the consequences of terrorism. The laws of the United States assign primary authority to the states to respond to the consequences of terrorism; the federal government provides assistance as required.

California Specialized Training Institute, 2019

Common Event-Specific Plans

Event-specific plans are developed expressly to address the needs and concerns of each particular incident. The Safety Officer's (SO) main role is to participate in the incident planning process, recommend modifications to maximize responder safety, and ensure that responders follow those plans. The SO also is responsible for producing, reviewing, and approving elements of event-specific plans that pertain to personnel safety. The section that follows identifies many of the event-specific plans in which the effective SO and Assistant Safety Officer-Hazardous Materials (ASO-HazMat) should be well-versed and able to use.

The Incident Action Plan

The Incident Action Plan (IAP), which is initially prepared by incident managers and contains general control objectives. These objectives reflect the overall incident strategy and specific action plans for the next operational period. When complete, the Incident Action Plan will include a number of attachments. The majority of these attachments are discussed in this chapter.

Development of an Incident Action Plan

The Incident Commander and the command and general staff, if activated, are responsible for developing the IAP. The plan is a compilation of various ICS forms and other documents pertinent to the particular incident. These documents may include weather briefings, safety messages, traffic plans, evacuation plans, exposure protection plans, or other information.

Any of the ICS forms may comprise the IAP. However, the ICS forms that typically are incorporated into the IAP are the 201 (Incident Briefing), 202 (Incident Objectives), 203 (Organization Assignment List), 204 (Division Assignment List), 205 (Incident Radio Communications Plan), 206 (Medical Plan), and 209 (Incident Status Summary).

Safety officials review the IAP for conflicts among incident objectives, management organization, division/group resources and tactics, and personnel safety. This requires that the safety official views each document with a critical eye toward risk/benefit. Safety officials suggest modifications to the IAP during the planning process—not after the plan has been issued to the field. Most accidents and near misses to Operations Section personnel occur as a direct result of the failure to comply with the elements of the IAP.

The SO should review two forms with special care: ICS 202 (Incident Objectives) and ICS 204 (Division Assignment List). These documents provide detail on the management objectives for the operational period, the resources assigned to each individual responsible for carrying out those objectives, and the tactical requirements that are to be achieved within the operational period. Conflict between safety and mitigating the incident are most likely to occur at these junctures.

California Specialized Training Institute, 2019

INCIDENT OBJECTIVES	1. INCIDENT NAME	2. DATE PREPARED	3. TIME PREPARED
	Aero Jet Incident	6/12/97	1230

4. OPERATIONAL PERIOD (DATE / TIME) 0600—1800

5. GENERAL CONTROL OBJECTIVES FOR THE INCIDENT (INCLUDE ALTERNATIVES)

* Initiate the ICS
* Isolate and deny entry—1000 ft radius around spill
* Evacuation
* Make notifications
* Identify Product
* Site Safety Plan
* Set up HazMat decon
* Rescue Victims
* Divert or stop leak/Prevent Entry into drain

6. WEATHER FORECAST FOR OPERATIONAL PERIOD Temp. 85ºF RH 75% Winds: North 8 MPH

7. GENERAL / SAFETY MESSAGE

* Safe approach from upwind, Alvarado to Broadway
* Full protective clothing SCUBA

8. ATTACHMENTS (CHECK IF ATTACHED)

3	ORGANIZATION LIST (ICS 203)	3	MEDICAL PLAN (ICS 206)		
3	DIVISION ASSIGNMENT LIST (ICS 204)	3	INCIDENT MAP – (2 MAPS)		PHONE DIRECTORY
3	COMMUNICATIONS PLAN (ICS 205)		TRAFFIC PLAN		

ICS 202 (SEMS 2001)	9. PREPARED BY (PLANNING / INTELLIGENCE SECTION CHIEF)	10. APPROVED BY (INCIDENT COMMANDER)
	William R. Redding	

The Communications Plan

The communications plan is designed to coordinate the available communications devices amongst the incident responders, based upon their need and priority. These devices may include radio frequencies, relay repeaters, telephones, cell phones, computer modems, FAX machines, and other communications resources.

Development of a Communications Plan

The Logistics Section Chief or the Communications Unit Leader, if activated, is responsible for developing the communications plan. The plan is incorporated into the Incident Action Plan through the use of ICS Form 205.

The person developing the Incident Radio Communications Plan uses ICS Forms 216 (Radio Frequencies Worksheet) and the 217 (Radio Frequency Assignment Sheet) to create a complete list of available frequencies. These frequencies are then assigned to incident uses, based upon needs and priorities.

The safety official is responsible for reviewing the Incident Radio Communication Plan. The purpose of this review is to ensure that clear lines of communication exist between all incident responders within the safety official's area of responsibility. Specific attention should be given to monitoring by assigned safety officials and to lines of communications between:

- Subordinates and supervisors
- Supervisors and emergency medical services and transports
- Aircraft and their controllers
- Hazardous materials Entry Teams and their supervisors

California Specialized Training Institute, 2019

INCIDENT RADIO COMMUNICATIONS PLAN	1. INCIDENT NAME Butte County Flood	2. DATE / TIME PREPARED 1/13/95 2300 HRS.	3. OPERATIONAL PERIOD (DATE / TIME) 1/14/95

4. BASIC RADIO CHANNEL UTILIZATION

SYSTEM / CACHE	CHANNEL	FUNCTION	FREQUENCY	ASSIGNMENT	REMARKS
CDF Command 2		Command	151.265 RX 157.330TX	Incident Command (Tone 3)	Available tactical NETS for multi-agency use: White #1 154.280 CLEMARS 154.920 CALCORD 156.075
BCSO NET #1 (Dispatch)		Tactical	154.725 RX 155.415 TX	Law Branch	
S.A.R. NET		Tactical	155.160 RX TX 155.940 RX 158.775 TX	Search and Rescue Branch (Tone 9–100.0)	
Butte Local NET (Dispatch)		Tactical	151.400 RX 159.375 TX	Fire Branch (Tone 5, 4, 2)	
B.C.P.W. (Dispatch)		Tactical	151.055 RX 159.120 TX	Public Works Branch	
Local Gov. NET		Tactical	155.940 RX 158.775 TX	Health and Welfare Branch (Tone 9–100.0)	

ICS 205 (SEMS 2001)	PREPARED BY: **William R. Redding** Logistics Chief

California Specialized Training Institute, 2019

The Medical Plan

The medical plan is intended to provide emergency medical services at the incident and to provide advanced medical support services to the incident at remote locations. It also serves as a checklist for various considerations, such as basic life support, advanced life support, paramedics, ambulance services, medical evacuation aircraft, burn centers, emergency contact numbers, and special precautions.

Development of the Medical Plan

The Logistics Section Chief or the Communications Unit Leader, if activated, is responsible for developing the medical plan. The plan is incorporated into the Incident Action Plan through the use of ICS Form 206. This form requires that personnel consider the location and staging of medical resources on-scene and at incident facilities, as well as the type and number of those resources.

Safety officials are responsible for reviewing and approving the medical plan. Safety officials must scrutinize the document to determine if the appropriate resources are on hand or available to deal sufficiently with anticipated accidents or injuries. Safety officials suggest modifications to the medical plan during the planning process. While some incidents do not require medical services standby, federal and state mandates do require on-scene medical services for some incidents. Hazardous materials incidents require, at a minimum, basic first aid and medical transport vehicles.

California Specialized Training Institute, 2019

MEDICAL PLAN

1. INCIDENT NAME	2. DATE PREPARED	3. TIME PREPARED	4. OPERATIONAL PERIOD
CASE	2/5/97	1400	Day shift 9/6

5. INCIDENT MEDICAL AID STATIONS

MEDICAL AID STATIONS	LOCATION	PARAMEDICS	
		YES	NO
Base Station	ICP Base camp near kitchen	3	
Line EMT I	Division B & C w/division sup.		3
Line EMT II	Division C & D w division sup.	3	

6. TRANSPORTATION

A. AMBULANCE SERVICE

NAME	ADDRESS	PHONE	PARAMEDICS	
			YES	NO
Exeter Dist. Amb	Exeter	See OS	3	
American Amb	Visalia		3	
Mobile Life Supp	Visalia		3	
Lemoore Nav Air Sta	Lemoore (flight surveillance available)		3	

B. INCIDENT AMBULANCES

NAME	LOCATION	PARAMEDICS	
		YES	NO
3 Rivers Amb	Station 14/South Fork Dr. and Hwy 198	3	

7. HOSPITALS

NAME	ADDRESS	TRAVEL TIME		PHONE	HELIPAD		BURN CENTER	
		AIR	GROUND		YES	NO	YES	NO
Exeter Dist	Exeter	x	25 mins.	See OS		3		3
Kaweah Delta	Visalia	x	35 mins			3		3
Valley Med Cent	Fresno	30 min	1 ½ hr		3		3	

8. MEDICAL EMERGENCY PROCEDURES

Phone contact with Amb Co & Hosp. will be through Visalia ECC

Minor injuries to be treated at aid stations on incident & brought to Base and Sta for further assessment (if needed).

Moderate or major injuries ***not*** requiring air lift to be stabilized

Transported by ambulance if not ambulatory. Ground trans if amb those injuries requiring airlift are to be treated at incident aid stations, transported to one of several helispots, and air lifted to VMC.

ICS 206 (SEMS 2001)	9. PREPARED BY (MEDICAL UNIT LEADER)	10. REVIEWED BY (SAFETY OFFICER)
	Longhorne/Simmonds Drenth/Green	none available @ base

The Site Safety and Control Plan

By definition, a hazardous waste site is an area where a substance has been released that can be found in the List of Known Carcinogens, Acutely Hazardous Substances List, Extremely Hazardous Materials List, the "Governor's List of Lists," or other similar documents. Federal law specifically requires incident managers to provide hazard communications to employees operating at hazardous waste sites. Managers must provide information on ten key areas for worker safety that are identified in the Code of Federal Regulations Title 29, 1910.120.

These ten elements are

1. Safety, health, and hazard risk analysis (including entry objectives)
2. Site organization (including training and qualifications)
3. Proper personnel protective equipment (identifying exact type and material)
4. Medical monitoring procedures
5. Monitoring and sampling procedures
6. Site control measures (including control zone locations)
7. Decontamination procedures
8. Pre-emergency response plan (including entry, fire, and medical)
9. Entry procedures for confined space (including backup and escape plans)
10. Spill containment program (drum/container handling)

The appendix to 29 CFR 1910.120 is the source for the term "site safety plan." The site safety plan has become an almost universal term for describing any document that details the elements necessary to safely mitigate a hazardous materials incident. The purpose of the site safety plan is to ensure the safety of onsite personnel, establish standard operating procedures, and identify a command structure. The site safety plan also provides a briefing document that informs responders of the incident's objectives, plans, and contingencies.

Standard operating procedures or standard operating guides (SOPs and SOGs) are appropriate for activities that can be standardized and where a checklist can be used. Examples of appropriate activities for SOPs or SOGs are respirator fit-testing and decontamination. These procedures should be developed ahead of time and based on the best available information about the incident, operational principles, and technical guidance. These procedures should be appropriate for the type of risks at the site, easy to understand and practice, and part of a regular training program. The procedures should then be tested by qualified health and safety personnel, and revised as necessary. Finally, copies of these SOPs and SOGs should be readily available to all personnel who will perform these functions.

California Specialized Training Institute, 2019

Development of a Site Safety Plan (Hazardous Materials)

The Incident Commander (IC) or the IC's appointed subordinate is responsible for developing the site safety and control plan (SSP). The Safety Officer is responsible for reviewing and approving the document (ICS-220-4(i). The Assistant Safety Officer—Hazardous Materials (ASO-HazMat) is responsible for

participating in the preparation and implementation of the plan (ICS 222-5(c)). The plan is incorporated into the Incident Action Plan through the use of ICS Form 208HM.

Best practices recommend that a document like an SSP be completed at every hazardous materials incident. This plan must address all phases of the incident and inform all personnel of the contents of the plan and hazards at the site. Poor management, lack of planning, and the failure to comply with nationally recognized practices are common problems that have been associated with hazardous materials incidents. By conducting a thorough site safety evaluation, all aspects of personnel safety, including the management structure, will be properly addressed.

One of the best ways to develop a site safety plan is to start with a standardized form, template, or checklist to focus on the elements necessary to ensure worker safety. The site safety plan should address the following elements:

- **General safety** of response personnel is the highest priority. All personnel are to be cautioned to work in a safe manner and report any unsafe actions or conditions to their supervisor or the safety official immediately. All personnel are to be briefed on the contents of the plan before entering any of the control zones.
- **Training** is to be provided to all personnel so they will be able to perform their assigned function or task. (It is a wise idea for the safety official to confirm the current certification of each responder assigned to the control zones).
- **Safety, health, and hazard risk assessment** identifies by chemical name and by UN/NA number the product involved in the incident. The primary and secondary hazards should be listed. All personnel should be briefed on all pertinent information regarding the material.
- **Site organization or command structure** identifies system and personnel assignments before work activities begin.
- **Consolidated Incident Action Plans** ensure that entry personnel have written objectives, understand such directives, and follow those in the performance of their duties. All personnel should be briefed on the incident objectives documented on ICS Form 202. The incident objective shall be incorporated into the site safety plan.
- **Personal Protective Equipment (PPE)** required to be worn in each control zone should be determined and documented. This includes both the protection level and type of garment to be used (e.g., butyl, CPE, Viton, etc.).
- **Medical monitoring procedures** should be conducted on all personnel who must use chemical protective clothing before and after work activities. This monitoring typically includes pulse, blood pressure, respiration, core body temperature, and body weight screening. Anyone whose recovery from the assigned activities does not meet acceptable medical standards should be barred from further work until cleared by a qualified medical authority.
- **Exposure documentation** should be conducted for personnel who have, or may have had, contact with the product. Employers should retain those documents for at least 30 years after an employee has left the team or separated from the job.

California Specialized Training Institute, 2019

- **Monitoring for hazards and sampling procedures** should be conducted for the exclusion zone. Monitoring instruments and/or devices should be used to detect primary/secondary hazards. Samples of the materials should be obtained and analyzed by the Technical Specialist—Hazardous Materials Reference. Samples may be retained in the event they may be needed for evidence. Containers with the product, or materials contaminated with the product, should be clearly labeled, placed in proper secondary containment, and segregated as appropriate.
- **Decontamination procedures** to limit the spread of the product should be performed on all personnel and equipment exiting the exclusion zone. The Decontamination Leader should direct all decontamination procedures. Containment of the majority of the product within the exclusion zone should be accomplished by limiting contact of the material, maintaining a clearly defined entry and exit, and using proper decontamination procedures for personnel and equipment. All personnel should be briefed on the decontamination procedures as established by the Decontamination Leader. These procedures should be incorporated into the site safety plan.
- **Site control measures (including control zone locations)** should be enforced by the Site Access Control Leader to limit access to all areas of the incident only to necessary and key personnel. All personnel should remain within the support zone unless directed otherwise by the Entry Leader or Decontamination Leader. Persons entering the exclusion zone should wear proper PPE. All personnel should be briefed on the locations of control lines and control zones as established by the Site Access Control Leader. Control measures and a map of the site/area should be incorporated into the site safety plan.
- **Response to unplanned events and emergencies** should include radio notification or repeated long blasts of a whistle or air horn to alert personnel in the event of an emergency or other unforeseen circumstance. Examples of emergency response (contingency) plans include:
  - **Entry Emergency:** Entry personnel should stop work, move to the safe refuge area, and await direction from the Entry Leader. Decontamination personnel should staff the decontamination area and await direction from the Decontamination Leader. All non-essential personnel, including the media, should leave the support zone pending a situation assessment.
  - **Fire Emergency:** In the event of a fire emergency involving the product, an **extinguishing agent** should be used and a (**distance**) perimeter established. A Suppression Group must be established in the support area to watch for fires and to provide suppression and rescue resources, as needed.
  - **Medical Emergency:** In the event of a medical emergency involving the product, the exposed person should be completely decontaminated before being transported from the scene. The designated receiving facility (name of hospital) should be notified, and transportation should be provided by (standby ambulance). Other medical emergencies, such as response personnel requiring first aid, should be directed to the Medical Unit Leader. The medical plan should be incorporated into the site safety plan.
- **Procedures for backup and escape** should ensure that rescue personnel and methods for extrication and removal are available immediately before entry in situations where personnel are operating in Level A suits, confined spaces, atmospheres in excess of the IDLH, or with an unknown product. A means of **secondary escape** should be identified and the route explained to all exclusion zone personnel. Personnel should conduct all physical activities using the buddy system. Working alone in

California Specialized Training Institute, 2019

protective clothing is not permitted. The Entry Team should exit the exclusion zone in the event of equipment malfunction in order to replace or repair such equipment.

- **Communications Plans** should be established to identify radio frequencies, other forms of communication in use, and who can use them. ICS Form 205 can be used for the communications plan and attached to the site safety plan. A separate frequency should be assigned for the exclusive use of the Entry Teams, Entry Leader, and the designated safety official.

The ASO-HazMat is responsible for ensuring that the site safety plan is strictly adhered to and followed. A copy of the site safety plan should be kept along with incident documentation.

California Specialized Training Institute, 2019

SITE SAFETY AND CONTROL PLAN ICS 208 (SEMS 2001)	1. INCIDENT NAME: Julio	2. DATE PREPARED: 5/13/97	3: OPERATIONAL PERIOD TIME: 1300–2200

SECTION I: SITE INFORMATION

4. INCIDENT LOCATION:
18th and Julio

SECTION II: ORGANIZATION

5. INCIDENT COMMANDER:	6. HM GROUP SUPERVISOR:	7. TECH. SPECIALIST – HM REFERENCE:
Layman	Johnson	Burson
8. SAFETY OFFICER:	**9. ENTRY LEADER:**	**10. SITE ACCESS CONTROL LEADER:**
Gill	Rice	Santos
11. ASSISTANT SAFETY OFFICER – HM:	**12. DECONTAMINATION LEADER:**	**13. SAFE REFUGE AREA MANAGER:**
Ortiz	Sutton	Tucker
14. ENVIRONMENTAL HEALTH:		
Stevens		

15. ENTRY TEAM (BUDDY SYSTEM) NAME	LEVEL	16. DECONTAMINATION ELEMENT NAME	LEVEL
ENTRY 1: Taza: FP	A	DECON 1: Waddle	B
ENTRY 2: Haas	A	DECON 2: Elting	B
ENTRY 3: May	A	DECON 3: Andrada	B
ENTRY 4: Waters	A	DECON 4: Spring	B

SECTION III: HAZARD / RISK ANALYSIS

17. MATERIAL	CONTAINER TYPE	QTY.	PHYS. STATE	pH	IDLH PAM	F.P.	I.T.	V.P. MM	V.D. MM	S.G.	LEL	UEL
Ethylene Oxide	MC351	4,000	61Q		800	−20		1.46		.82	3	100
Ethylene Dioxemide	R/R Car	5,500	21Q		100			12	<.D1	2.17		

COMMENT:

SECTION IV: HAZARD MONITORING

18. LEL INSTRUMENT(S): Gas Tech 1314	19. O_2 INSTRUMENT(S): Gas Tech 1314
20. TOXICITY / PPM INSTRUMENT(S): IS 412	21. RADIOLOGICAL INSTRUMENT(S): CD 777–CDC

COMMENT:

SECTION V: DECONTAMINATION PROCEDURES

22. STANDARD DECONTAMINATION PROCEDURES: YES: 3 NO: COMMENT:

SECTION VI: SITE COMMUNICATIONS

23. COMMAND FREQUENCY: 154.445	24. TACTICAL FREQUENCY: 151.280	25. ENTRY FREQUENCY: 123.456

SECTION VII: MEDICAL ASSISTANCE

26. MEDICAL MONITORING	YES: 3	NO:	27. MEDICAL TREATMENT AND TRANSPORT IN-PLACE	YES: 3	NO:

COMMENT:

SECTION VIII. SITE MAP

28. SITE MAP:

▲

N

WEATHER	☐
COMMAND POST	☐
ZONES	☐
ASSEMBLY AREAS	☐
ESCAPE ROUTES	☐
OTHER	☐

SECTION IX: ENTRY OBJECTIVES

29. ENTRY OBJECTIVES:

SECTION X: SOP'S AND SAFE WORK PRACTICES

30. MODIFICATIONS TO DOCUMENTED SOP'S AND WORK PRACTICES	YES:	NO:	

COMMENT:

SECTION XI: EMERGENCY PROCEDURES

31. EMERGENCY PROCEDURES:

SECTION XII. SAFETY BRIEFING

32. ASSISTANT SAFETY OFFICER HM SIGNATURE:	SAFETY BRIEFING COMPLETED (TIME):
33. HM GROUP SUPERVISOR SIGNATURE:	34. INCIDENT COMMANDER SIGNATURE:

Site Safety Plan (non-Hazardous Materials)

With the deaths of emergency responders at locations such as Storm King Mountain, Kansas City, and Hackensack, there has been a strong drive to provide site safety plans at all incidents and training exercises. The National Fire Protection Association (NFPA) has advocated such plans for several years, and they are mentioned in NFPA documents 1500, 1520, and 1521. Moreover, safety officials are now routinely assigned to all types of emergency activities.

The demobilization Plan

The function of the demobilization plan is to release incident resources as they become available and in an efficient manner. The plan consists of five basic sections:

1. **General Information** discusses sleep, destination, and transportation limitations. It includes a departure briefing on methods of travel, destinations, estimated times of arrival, and transportation arrangements.
2. **Responsibilities** discusses personnel responsibilities for staffing check-out stations, identification of surplus resources, release approvals, agency dispatch notifications, and transportation arrangements.
3. **Release Priorities** identifies resources that have the highest priority for release, which usually include allied agencies and units farthest from home.
4. **Release Procedures** determines the procedures for preliminary transportation needs, return of issued property, final feeding needs, and for completion of finance documents. Incident managers can require that all personnel attend an incident debriefing as part of this process (as required at hazardous materials incidents—SARA Title III, § 303 & 311).
5. **Travel Information** includes information on rest requirements, travel restrictions, travel routes, weather information, fiscal information, phone numbers, and the traffic plan.

Development of a Demobilization Plan

The Planning Section Chief or the Demobilization Unit Leader, if activated, is responsible for developing the demobilization plan. No specific ICS form exists for the Demobilization Plan. The demobilization plan is written or typed. It is based on directives from the Incident Commander and Planning Section Chief and on information from the various agencies, supervisors, and leaders.

Once the plan is established, each supervisor or mobile unit (Patrol Unit, Ambulance, HazMat Unit, etc.) is issued an ICS Form 221 (Demobilization Checkout). The person to whom the Demobilization Checkout form has been issued is responsible for proceeding to each incident facility identified on the form (supply unit, communications unit, ground support unit, etc.) for release approval.

The safety official is responsible for reviewing the demobilization plan and the process itself. The plan may reflect pressures to release resources prematurely. Units and personnel must not be released prior to receiving sufficient rest, food, and information to safely reach their destinations. Agencies may also be under governmental restrictions that affect the release and travel of resources. An example of this is the

California Specialized Training Institute, 2019

seventeen-hour driving rule. The process itself may present hazards due to congestion, large amounts of pedestrian and vehicular traffic, dust/visability, and other potential hazards.

Sample Demobilization Plan (Metz Fire)

A safe and orderly release of most resources is expected within the next 24 hours. The following plan will be in effect:

1. No equipment/personnel will be released without a completed demob checkout sheet (ICS 221).
2. Declared excess resources will be held in base until they are ready for demob inspection.
3. Demob inspections will be held at Gabilan Camp.
4. All unit leaders will be briefed prior to release (travel, ETA, feeding, etc.).
5. All Section Chiefs:
    a. Submit surplus resources list
    b. Staff check-out stations
6. Plans Section will compile tentative releases.
7. IC will review and approve.
8. Local ECC will notify region ECC of surpluses.
9. Demob Unit will prepare final releases.
10. Demob Unit will notify Resource Unit of releases.
11. Logistics Unit will clear check-out items (supply, etc.).
12. Facilities Unit will assure clean sleeping areas.
13. Finance Section Chief will complete time/equipment reports.
14. Final Release Sheet (ICS 221) will be completed and turned in at Gabilan Camp (Time Unit!).
15. Ground support will make transportation arrangements as necessary.
16. All tentative releases will be posted at the check-in location.

The Evacuation Plan

An evacuation plan may have two different purposes. The first purpose is to remove citizens from the advance of an incident. The second purpose is to provide a fall-back means of protection for incident responders and the public. Both plans are appropriate to all risks when the need may arise.

Development of an Evacuation Plan

The Planning Section Chief or designated subordinate, if activated, is responsible for developing the evacuation plan. No specific ICS form exists for the evacuation plan. It is written or typed. It is based on directives from the Incident Commander and Planning Section Chief and on information from the various supervisors and leaders.

California Specialized Training Institute, 2019

The safety official is responsible for reviewing the evacuation plan to ensure that responders and civilians are protected in the event of catastrophic change in the incident. Again, responder health and safety outweigh the potential of greater damage to the environment and property losses that may result from remaining at the incident. Resources and equipment must be available, in place, and reserved for these contingencies for them to succeed.

Sample Community Evacuation Plan

Any further eastward movement of the fire will directly endanger human life and property in the St. Vrain Valley and in the community of Allenspark, Colorado. Evacuation of people from these areas must be done immediately in a systematic and coordinated manner. Other than incident management personnel, all people in the danger area are the responsibility, and under the jurisdiction, of the Boulder County Sheriff.

To prepare for a coordinated evacuation, the following pre-evacuation operations must be performed:

1. Establish a command operation to be directed by the Boulder County Sheriff and that includes:
   a. Colorado Highway Patrol
   b. Boulder County Supervisor
   c. Salvation Army and American Red Cross Representatives
   d. USDA Forest Service Representative
   e. Information Officer
   f. Logistics Chief
   g. Incident Safety Officer
2. Conduct a complete and up-to-date census of all inhabitants within the evacuation area, complete with map indicating the location of each person.
3. Inventory all motor vehicles and aircraft available for evacuation.
4. Establish evacuation center to house and feed evacuees well away from path of fire.
5. Establish communications network for exclusive use of evacuation operation.
6. Establish and map evacuation routes with checkpoints to establish a roster of evacuees.
7. Establish emergency fuel and towing services along evacuation routes.

The Traffic Plan

The purpose of the traffic plan is to ensure both pedestrian and vehicular safety at incidents. Access to some incidents precludes two-way traffic, while others have travel routes in extremely poor condition. The traffic plan is intended to safely synchronize the movement of personnel and rolling stock at emergencies and through incident facilities. In addition, the nature of some tasks with incident work zones may prohibit simultaneous vehicular and pedestrian traffic.

California Specialized Training Institute, 2019

Development of a Traffic Plan

The Logistics Section Chief or the Facilities Unit Leader and/or the Base Manager and Camp Manager, if activated, are responsible for developing the traffic plan. No specific ICS form exists for the traffic plan. This plan is written or typed. It includes directives from the Incident Commander and the Planning Section Chief, as well as information from various supervisors and leaders.

The traffic plan must take into account impediments to visibility (such as dust, smoke, and fog) and pedestrians, both at the work site and while back at incident facilities. Many surface roads are too narrow or rough to allow two-way traffic or speed of travel. Travel to, on, and from incidents should be limited to one way into and out of the incident, whenever feasible.

Safety officials must also take into account conflicts in traffic patterns. For example, traffic plans should consider situations in which pedestrian and vehicular traffic may be co-located. This is most common in rest and rehabilitation sites and at the incident's facilities where activities such as fueling, parking, feeding, and sleeping occur. Traffic plans also must ensure that pedestrians and vehicles do not use the same decontamination corridor simultaneously. Decontamination services require that all resources entering control zones be cleaned or disposed of. Personnel and, generally, vehicles are not disposable items. This requires that egress routes be established out of the control zones that do not compromise the safety of either.

California Specialized Training Institute, 2019

Other Plans and Checklists

Each incident presents both similar and unique safety issues. In the case of incidents with similar safety issues, safety officials usually can rely on ICS forms to develop an appropriate response plan. However, safety officials must also be prepared to develop their own plans and checklists to address the safety issues that are unique to a particular site or event.

Site-Specific Plans and Checklists

In addition to addressing the on-scene safety of personnel, the safety official must also focus on the often overlooked safety of personnel when off the incident—while in base, camp, or other locations. Plans and checklists to address potential safety issues, such as site weather, topography, access and egress, already exist throughout the emergency response community. They also deal with subjects such as rest and rehabilitation, sanitation, security, parking, vehicle maintenance and repair, power, fueling, and feeding.

Development of Other Site-Specific Plans and Checklists

The safety officials assigned to an incident are solely responsible for developing other site-specific plans. No ICS forms exist to assist safety officials in this task. Safety officials must use their experience, training, and common sense to develop these plans and checklists. However, networking with other agencies that have already dealt with similar problems can yield excellent site-specific plans and checklists.

Other Event-Specific Plans and Checklists

These plans typically deal with single subject emergencies, or facets of an incident that are peculiar to them. Common event-specific plans deal with flood, earthquake, urban search and rescue, high-rise, high/low angle rescue, etc. Components of these plans deal with strategies, tactics, safety, resource allocation, and other subjects, but are not ICS forms. Agencies generate these plans to fulfill specific needs they have recognized.

California Specialized Training Institute, 2019

Terminating the Incident

Once the responsible health agency or other designated responsible party has issued the final clearance, it is important to terminate the hazardous materials incident through formal and specific written procedures. The termination process should document the safety procedures taken, the site operations conducted, the hazards faced, and the lessons learned during the incident. This documentation also provides a record of the information and data that may be required in order to comply with local, state, and federal laws. Incident termination procedures also help prepare the agency and its personnel for potential litigation that may arise from the incident.

Incident termination activities are usually divided into three separate phases:

- Debriefing the incident
- Post-incident analysis
- Critiques

Failure to properly manage termination activities could have long-term consequences. Incident managers and safety officials must take the time to assess what has happened and to determine what still needs to be accomplished. The termination phase usually uncovers the use of incorrect data or assumptions during the mitigation process. This, in turn, provides opportunities for making corrections. Corrected information may then be disseminated through the debriefing, post-incident analysis, and critique processes. This may ensure that mistakes are not repeated and that necessary modifications are made for the cleanup and disposal phases.

debriefings

A debriefing should occur during demobilization as soon as the "emergency" phase of the operation is completed, and if possible, before first responders have left the scene. Debriefing should include the initial responders, hazardous materials response teams, decontamination teams, EMS workers, command and general staff, division and group supervisors, agency representatives, and other key players as specified by the Incident Commander.

As part of the debriefing, safety officials ensure that hazard communication information (required under Superfund Amendments and Reauthorization Act Title III) is accurate and complete, that exposure reporting (also required) is complete, and that personnel are informed of actions to take if signs and symptoms of exposure develop at a later time.

An effective debriefing should last no more than 5 to 20 minutes and should:

- Inform responders of the hazards they were, or possibly were, exposed to; explain signs and symptoms; and describe what procedures to take if signs or symptoms develop later.
- Identify equipment damage and unsafe conditions that require immediate attention or isolation for further evaluation.
- Assign information-gathering responsibilities for a post-incident analysis and critique.
- Summarize the activities performed by divisions and groups.

California Specialized Training Institute, 2019

- Reinforce positive aspects of the response. (This is the appropriate time to say, "Thanks for taking on a difficult job. Well done!")

One person who acts as the spokesperson should conduct the debriefing. The Incident Commander may not be the best facilitator, or may not be available for the entire debriefing, but should be present to summarize the incident and reinforce positive aspects. The spokesperson should be someone in authority who can take a "big picture" view of the incident. The intent is to briefly review the incident, not to analyze or critique every action of every player. More discussion on a specific subject or operation can be continued *after* the debriefing, as needed.

Post-Incident Analysis

Most agencies require some form of after-action report following an incident. This report goes by many names, such as post-incident analysis (PIA), manager's report, and after-action report. This report may serve several purposes, such as providing internal review of agency actions and policies, investigating accidents and injuries, conducting statistical analyses, assessing training and equipment needs, and determining compliance and enforcement.

The PIA is a reconstruction of an incident to assess the chain of events that took place, the methods used to control the incident, and how the actions of emergency response personnel contributed to the eventual outcome. The PIA should be started as soon as possible after the "emergency" phase of the incident.

The main purpose of the PIA is to reinforce effective personnel actions and departmental procedures and to provide information to help management improve the effectiveness of the department's operations.

PIA activities should be assigned to a member of the command or general staff, such as the Information Officer, Safety Officer, Liaison Officer, or Planning Section Chief during the debriefing. Safety officials play an important part in the PIA process. They participate in incident reviews, conduct investiga- tions into accidents and injuries, report on "near misses," and complete safety assessments of incident operations.

The Health and Safety Officer also has specific duties and responsibilities as part of post-incident evaluation and analysis. These functions include investigations; risk management; training and education; development of or revisions to procedures; and modifications for clothing, equipment, apparatus, or facilities. The HSO also can have a significant impact because negative aspects of an incident or situation tend to be overlooked or forgotten quickly.

Termination activities should coincide with normal work assignments on the scene. The compilation of data and their analysis may take days or weeks (or longer on a major incident) to complete. A brief, chronological review of who, what, when, and where should be outlined. The ICS Form 214 (Unit Log) is the ideal document to accomplish this task. A simple timeline placing key players at specific locations at different times may also be useful.

The command staff officer who has been assigned to collect information about the response will need to meet with the Incident Commander to review key events and identify subjects for follow-up. Information for this review can be acquired from:

- Chemical hazard information sources and documents

California Specialized Training Institute, 2019

- Responder notes and Unit Logs
- Audio records/documents
- Visual records/documents
- Injury and exposure records
- Incident Action Plans
- Owner/operator information (such as business cards or notes from agency, organization, or company representatives)
- Witness/responder transcripts

After the information has been compiled, a rough-draft report analyzing the materials is developed. The PIA should focus on four key topics:

- Command and control
- Tactical operations
- Resources
- Support services

Key responders should review the rough-draft of the PIA report to verify the facts and timelines of the incident. The completed report should be forwarded to management for review and disseminated throughout the management system. Problems discovered during this process may pinpoint areas that need future modification or improvement, and should be thoroughly discussed in the critique session.

California Specialized Training Institute, 2019

Sample Post-Incident Analysis

Post-Incident Analysis Summary

DATE:	TIME OF ALARM:
ADDRESS:	
TYPE OF INCIDENT:	

Situation Upon Arrival of First Units: (Include a brief description of the situation encountered by the first unit(s) arriving on the scene. The type of units and manpower on units should be listed.)

Final Outcome of Incidents: (List extent of damage and casualties. Also include damage to fire equipment and emergency personnel casualties.)

Equipment Committed to Incident: (List manpower and units committed to the incident. Include participating volunteers and paid off-duty personnel who responded in private automobiles.)

California Specialized Training Institute, 2019

Critiques

Critiques for major and catastrophic hazardous materials incidents are *mandated* by the Final Rule of 29 CFR 1910. The Incident Commander has direct responsibility for scheduling and organizing the critique. Critiques should be held after the incident has been completely terminated and information has been gathered and analyzed. Effective critiquing sessions are a positive way to outline lessons learned and should be designed to improve responder performance by increasing efficiency and pinpointing weaknesses. A good critique promotes trust in the response system as a self-correcting operational unit, and helps in preplanning for significant future incidents. It also provides an opportunity for sharing information between response agencies.

The critique also is a valid and important training tool. In fact, OSHA, under 29 CFR 1910, has suggested that critiques of emergency response performance can satisfy the mandated refresher training requirements for employees. OSHA's rationale is that employees who have actual knowledge of the acceptable and non-acceptable actions that have occurred during a response will perform in a more appropriate manner during the next emergency response.

The safety official's participation during the critique may be essential for improving future operational effectiveness and safety. The safety official is principally tasked with conducting a continuous risk-benefit analysis of incident operations. This provides the safety official with the knowledge and oversight for discussing any conflicts that may have arisen between safety and incident efficiency and effectiveness. In addition, the safety official ensures that all facts are available and honestly provided to the other participants.

Due to the nature of a critique, it is important to understand that this is not the time, nor the place, to include the news media. A legitimate way to exclude the news media is to schedule and organize the critique under the auspices of a "training session." Follow these simple precautions:

- Conduct the critique within the auspices of a training session.
- Limit participation to individuals involved in the incident.
- Ensure that news media are not involved in the critique.
- Do not record the critique through video or audio tapes.
- Have all parties involved agree that these discussions will remain confidential.
- Limit conclusions to ways future responses could be improved through training and education.

Conducting a critique in this manner better serves the real purpose of a critique, which is to improve future performance. Personnel should feel free to discuss errors and identify areas that need improvement. However, discussing these areas with the public and the news media could affect legal outcomes in court later.

The critique leader does not have to be the Incident Commander or even a ranking officer. Local experts or informed third parties can fill this role. It is important, however, for the critique leader to be an effective facilitator. Good facilitation skills can be crucial to the effectiveness of the critique session. This is especially true in the case of large incidents where a myriad of agencies have been involved and gray areas of authority and responsibilities need to be considered. The critique leader must have the ability to:

- Control the critique, introduce the players and procedures, and keep it moving.

California Specialized Training Institute, 2019

- Ensure that direct questions receive direct answers.
- Ensure all participants play by the critique rules.
- Ensure that each operational group presents their observations.
- Summarize the lessons learned.

The duties of the safety official do not end with termination of the incident. Everyone has a right to know what hazards they have faced and how to prevent exposures from occurring in the future. Make sure that your job does not end until all lessons have been learned and shared with others.

The ICS Form 214 (Unit Log)

Properly completed, the ICS Form 214 (Unit Log) provides a chronological record of events within each function and position within the Incident Command System. It is a valuable tool for assessing the actions of responders, analyzing events at the incident, providing protection for the agency, and improving future performance. Unfortunately, Unit Logs are routinely filled out too late, after the fact, poorly, or not at all.

Development of the ICS Form 214 Unit Log

Each individual who is assigned responsibilities and a title within the ICS (e.g., Commander, Officer, Chief, Director, Supervisor, Leader, Manager, Technical Specialist, Observer, etc.) is responsible for developing the Unit Log.

The Unit Log is intended to record any significant event occurring within the jurisdiction of the individual responsible for filling it out. Such events include the times that directives were given and completed, deviations from the assigned objectives, entry and departure by personnel from control zones, accidents and injuries, and other notable occurrences.

Safety officials are responsible for ensuring that they—and their immediate subordinates—document thoroughly the events that occur within their duties. These events may include facility and operational area inspections, reports and investigations of accidents or injuries, personnel arrivals and departures, and any other pertinent information.

California Specialized Training Institute, 2019

UNIT LOG **ICS 214** (SEMS 2001)	1. INCIDENT NAME Homstead	2. DATE PREPARED 5/6/97	3. TIME PREPARED 1715
4. UNIT NAME / DESIGNATOR Safety	5. UNIT LEADER (NAME AND POSITION) Daniel Law I.S.O.	6. OPERATIONAL PERIOD 066–1800	

7. PERSONNEL ROSTER ASSIGNED

NAME	ICS POSITION	HOME BASE
R# 0–11 FC Delgado,	A.S.O. DIV. A	Yucca Valley
R# 0–12 FC Sowards,	A.S.O. DIV. B	Apple Valley
R# 0–13 FC Thomas, C.	A.S.O. DIV. A/C	Apple Valley
R# 0–14 FC Drenth,	A.S.O.–T Fac.	Apple Valley

8. ACTIVITY LOG (CONTINUE ON REVERSE)

TIME	MAJOR EVENTS
0600	Briefing: 350 personnel assigned to Day Shift. ICP moved to STA #14, staging to
	STA #19. IC requests I observe USAR TF in Div. A and check validity of Red Cross
	use of elementary school as relocation center. I am to accompany IC on Obs.
	Flight of Div. C later in day (Pines Cyn.). Expect extensive media and public access
	attempts into area today. 4 ASOs arrived and assigned as follows: Delgado, Div.
	A; Sowards, Div. B; Thomas, Div. A until C is accessible then Div. C, and Drenth, “T”
	Incident Facilities, under my guidance. I will work in Div. B until “C” is accessible—
	then to “A.”
1026	Inspected school (Homstead Relocation Center) with Rick Wilson, SBC Building
	Insp. (Lt. Eng.) is OK—relayed information to Red Cross, Liaison and IC. 1130
	flight (helo) over Div. C with orders delegated to ASO Thomas. 10–15% of buildings
	inspected.

Personnel Monitoring



Scope

This chapter provides an overview of the role of the Assistant Safety Officer-Hazardous Materials in on-scene personnel monitoring during a hazardous materials response.



Terminal Learning Objective (TLO)

At end of instruction for Chapter 6, participants will be able to implement the elements of personnel monitoring to protect hazardous materials responders' health and safety.



Enabling Learning Objectives (ELOs)

This chapter's enabling learning objectives are to ensure participants will be able to:

1. Explain the role of baseline and routine medical examinations in personnel monitoring.
2. Describe the elements of an effective on-scene medical monitoring program.
3. Examine the elements of an incident rehabilitation program.

Supporting Materials/resource List

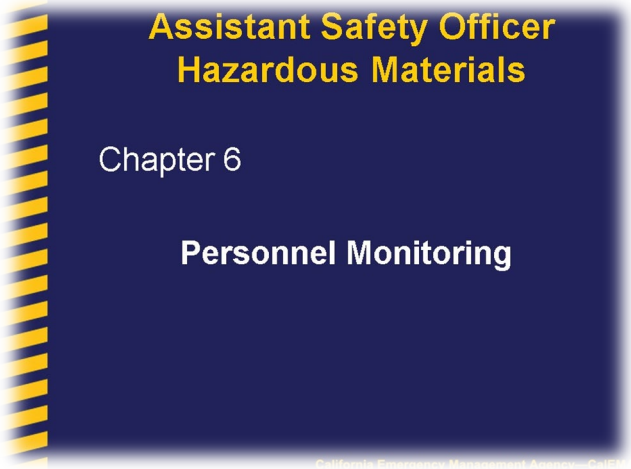
See Supporting Materials/Resource List section starting on page 283.



Practical Exercises

See Practical Exercises section starting on page 307.

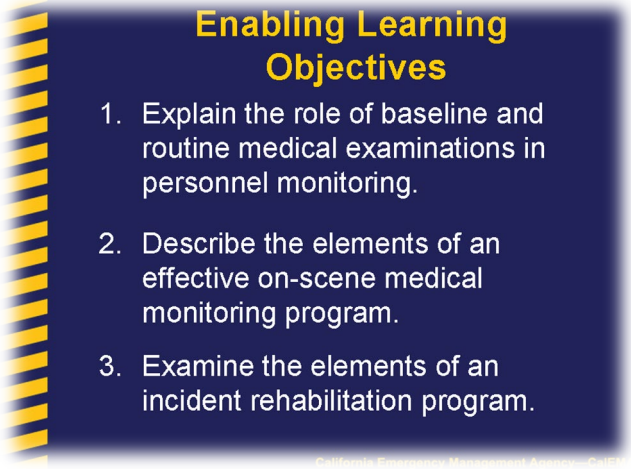
California Specialized Training Institute, 2019



Slide 6.1

The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

- (Res.A.2 1) Establish procedures for the immediate incident scene.
- (Res.B.1 16.3) Perform ambient and task specific worker exposure monitoring for hazardous substances and inform workers of relevant risks.
- (Res.B.2 5.4) Ensure the safety of all on-scene responders.

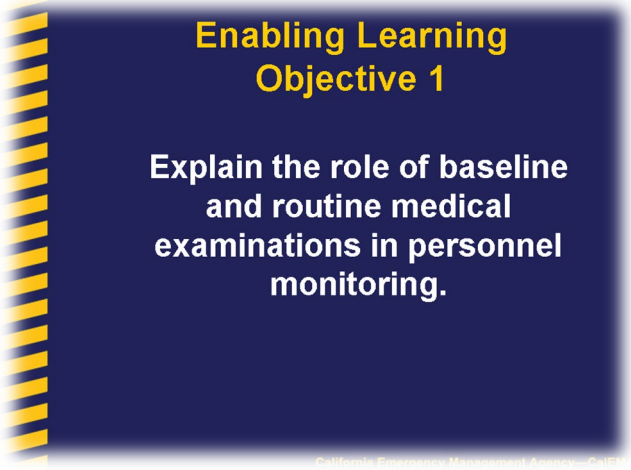


Slide 6.2

The goal (terminal learning objective) of this chapter is to ensure participants will be able to implement the elements of personnel monitoring to protect hazardous materials responders' health and safety.

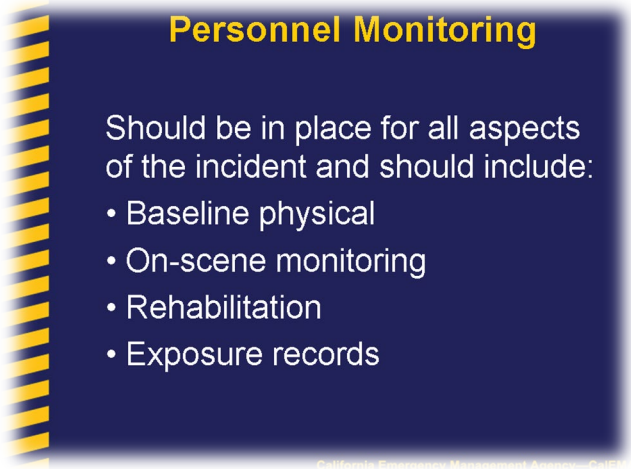
This chapter's enabling learning objectives are to ensure participants will be able to:

1. Explain the role of baseline and routine medical examinations in personnel monitoring.
2. Describe the components of an effective on-scene medical monitoring program.
3. Examine the elements of an incident rehabilitation program.



Slide 6.3

California Specialized Training Institute, 2019

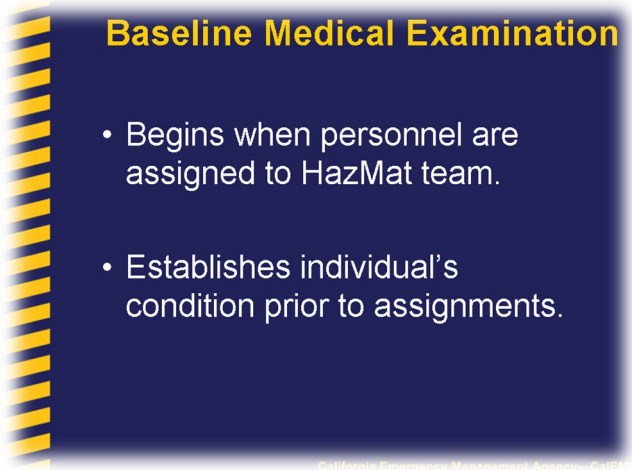


Slide 6.4

The Assistant Safety Officer at hazardous materials incidents must ensure that proper personnel monitoring is in place for all aspects of the incident. Personnel monitoring begins with verification of baseline physical information and also includes on-scene medical monitoring, provisions for rehabilitation, and recording exposure, or suspected exposure, to hazardous materials.

Personnel who are involved in responding to hazardous materials incidents as a regular function of their employment should have baseline medical examinations. They should also receive pre-entry and post-entry medical monitoring.

Personnel who are not involved in responding to hazardous materials incidents as a regular function of their employment do not need a baseline exam, but they must receive pre-entry and post-entry medical monitoring.



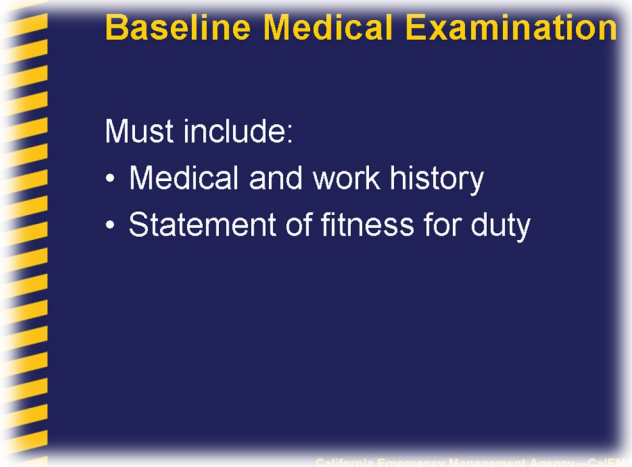
Slide 6.5

Baseline medical examinations begin when personnel are assigned to the hazardous materials team. The baseline physical establishes an individual's condition prior to assignment.

The minimum content and procedures are governed by Title 29, Code of Federal Regulations, Part 1910.120 and California Code of Regulations Title 8, Section 5192.

However, the content and procedures vary by local jurisdiction and medical authority. The employer must bear the cost of baseline medical examinations.

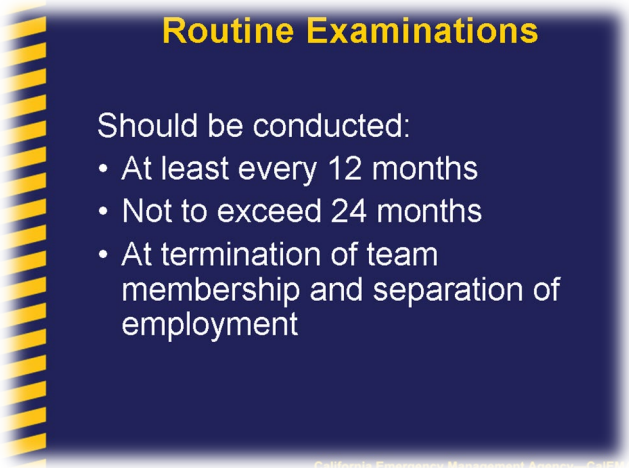
California Specialized Training Institute, 2019



Slide 6.6

At a minimum, the medical examination must include a medical history and work history that includes previous exposure and symptoms related to hazardous materials.

In addition, the exam must address fitness to wear Personal Protective Equipment (PPE). Following the evaluation, the physician provides the employer with a written assessment of the employee's fitness for duty.

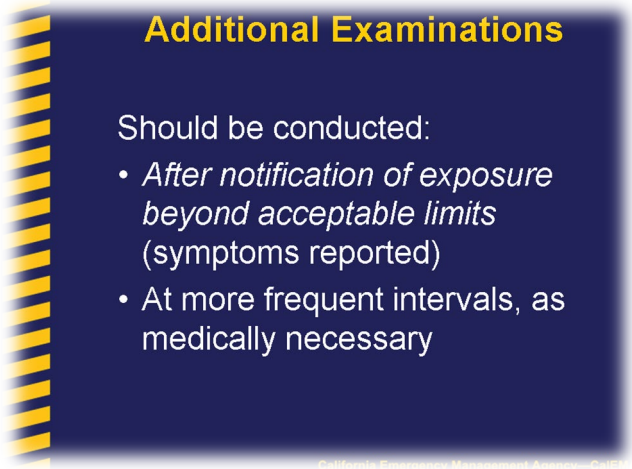


Slide 6.7

The baseline physical is followed up by subsequent physical examinations on a regular basis. These physical exams must be conducted at least every 12 months (unless a medical authority specifies a longer period) and must not exceed 24 months. A physical exam should also be conducted when an employee ceases to be part of a hazmat team and when an employee terminates employment with the agency.

As with baseline exams, the content and procedures of follow-up exams are also specified by the local jurisdiction. At a minimum, the medical examinations must include a medical history and work history that emphasizes symptoms related to handling hazardous materials, and a statement indicating an employee's fitness for duty. In addition, the exams must address the employee's fitness to wear PPE.

California Specialized Training Institute, 2019



Slide 6.8

In addition, physical examinations should be conducted:

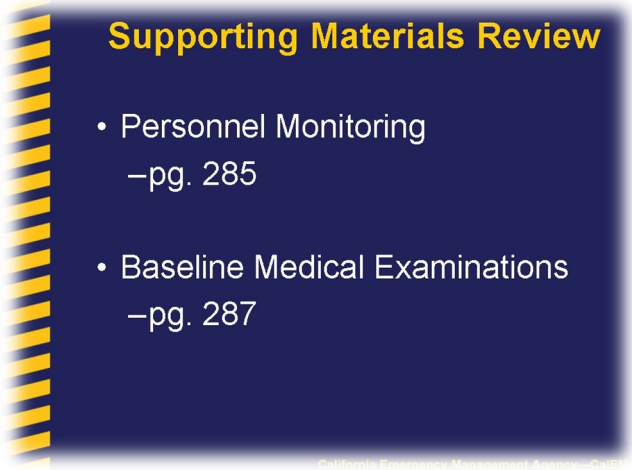
- As soon as possible upon notification by an employee of exposure to hazardous materials beyond the acceptable exposure limits
- At more frequent intervals, as determined by a medical authority



Slide 6.9

The results of these examinations are confidential. Confidentiality of medical records is protected under the Health Information Portability and Accountability Act (HIPAA).

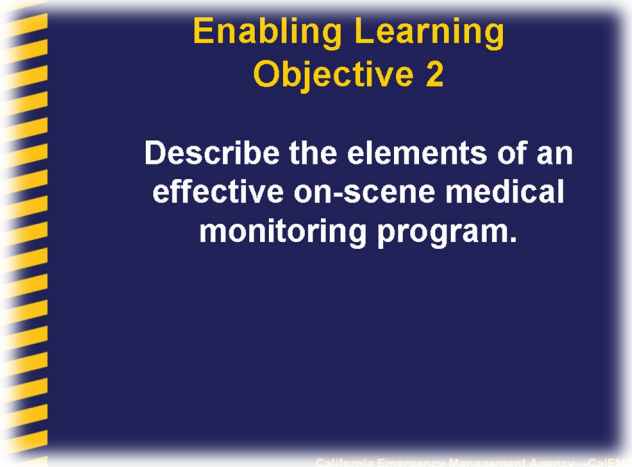
Medical records for hazardous materials workers must be maintained for 30 years after the end of employment.



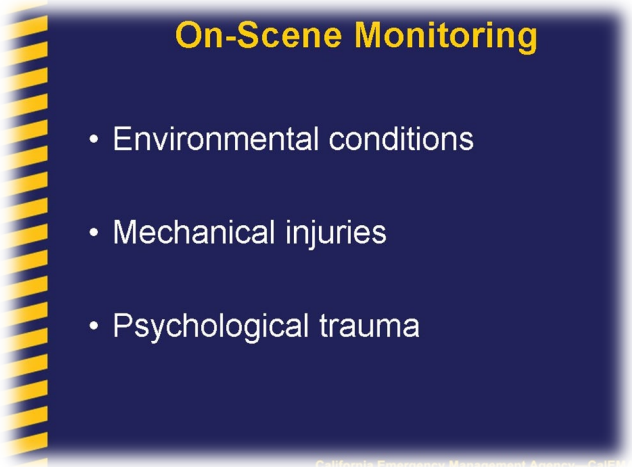
Slide 6.10

Review the listed supporting materials in the participant guide, pages 285 and 287.

California Specialized Training Institute, 2019



Slide 6.11



Slide 6.12

Before getting into the specifics of medical monitoring, it's important to address other aspects of on-scene monitoring.

At the minimum, the Site Safety Plan should address temperature, relative humidity, and wind speed. These factors can greatly affect the health and well-being of on-scene emergency response personnel.

The Health and Safety Plan should include procedures for monitoring airborne, waterborne, or soil-borne contaminants to ensure the safety of responders, as well as the affected population. Chapter 8 will provide detailed information on environmental monitoring.

Precariously positioned or sharp objects, visibility, unstable surfaces, the inherent dangers of working around heavy equipment, etc., can lead to mechanical injuries.

Responding to hazardous materials incidents is physically demanding. As a result, the initial focus of personnel monitoring is on physical aspects of responder well-being, such as heat stress. However, monitoring for psychological stress is equally as important.

California Specialized Training Institute, 2019



AFTERMATH OF ATTACKS

Firefighters suffering stress-related problems

HUNDREDS PUT OFF ACTIVE DUTY BECAUSE OF SEVERE SYMPTOMS

ASSOCIATED PRESS

NEW YORK — Hundreds of firefighters and emergency medical workers who responded to the World Trade Center attack have reported nightmares, sudden anger and other psychological symptoms so severe that they were taken off active duty.

The 14,000-member Fire Department said it has put about 350 people with stress-related problems on light duty or medical leave since Sept. 11.

Nearly 2,000 more firefighters, fire officers and workers in the department's Emergency Medical Service unit have seen a counselor since Sept. 11 through the FDNY's counseling services unit.

The number is unexpectedly large for an institution that traditionally prefers to handle problems within the close-knit firehouse fraternity.

"Few people would have predicted as many firefighters would come forward looking for help," said Terence Keane, a counseling unit consultant who heads the National Center for Post-Traumatic Stress Disorder in Boston.

Firefighters say the staggering losses of Sept. 11 changed perceptions of the counseling unit, once seen as only for those with drug or alcohol problems. The department lost 343 members when the twin towers collapsed.

"Before this, guys would not even dream of going to counseling," said 10-year firefighter Vinny Picciano, who sees a counselor once a week. "Now, the guys that are coming down, they realize something is wrong. Guys are hurting."

Of the 350 placed on light duty or medical leave, about 100 remained off the active roster as of Wednesday. Many others have retired or returned to work.

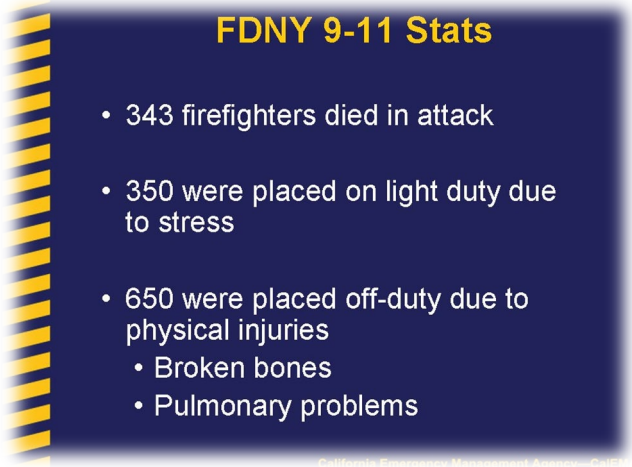
An additional 650 fire personnel are on light duty or medical leave because of physical injuries, from respiratory ailments to broken bones. Some of them are said to have symptoms of extreme stress.

About one-fifth of those in counseling suffer from post-traumatic stress disorder, a severe reaction that can require intensive counseling and medication, counseling services unit director Malachy Corrigan said

Slide 6.13

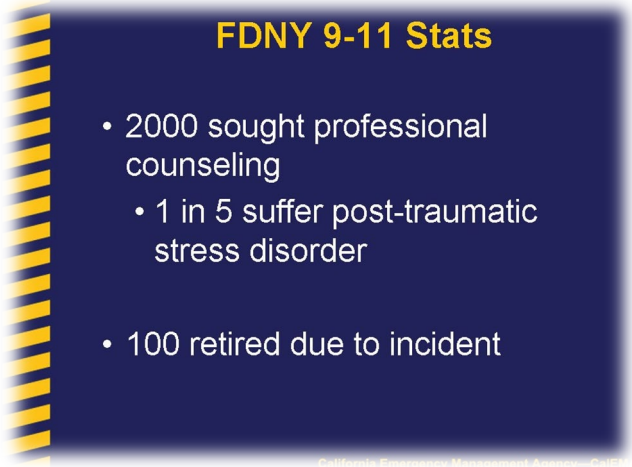
This newspaper article highlights the psychological trauma firefighters and EMS workers in the New York City Fire Department (FDNY) experienced in the aftermath of 9-11.

The following two slides provide statistics from this article.



Slide 6.14

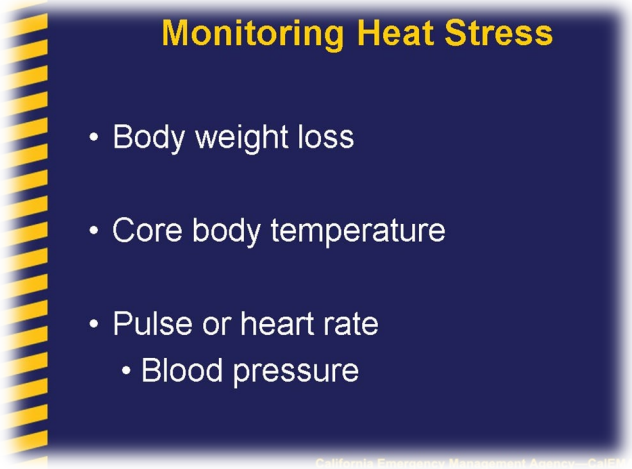
Of those firefighters taken off active duty because of physical injuries, many also suffered from extreme stress.



Slide 6.15

Thousands sought counseling, with one in five suffering from post-traumatic stress disorder (PTSD).

Materials on Critical Incident Stress debriefing and Critical Incident Stress defusing were presented in Chapter 4.

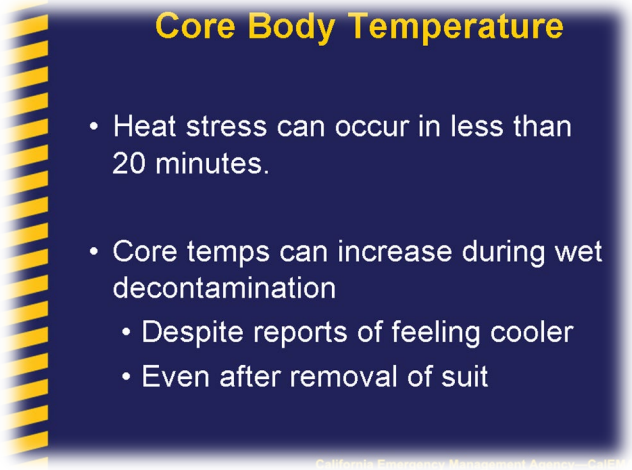


Slide 6.16

Heat-related illnesses are a major cause of injuries to hazardous materials responders. Advances in medical science have altered our understanding of what constitutes heat illnesses and which indicators accurately measure heat stress.

In the past, we believed that the best indicators of heat distress were temperature, heart rate, and blood pressure. We now know that more accurate measures of heat distress are water weight loss, core body temperature, and heart rate. An effective medical monitoring program should include assessments of these essential factors.

Although heat stress is not believed to immediately affect blood pressure, it is worth monitoring because it is a measurement of the "quality" of rest by the heart muscle between each stroke.



Slide 6.17

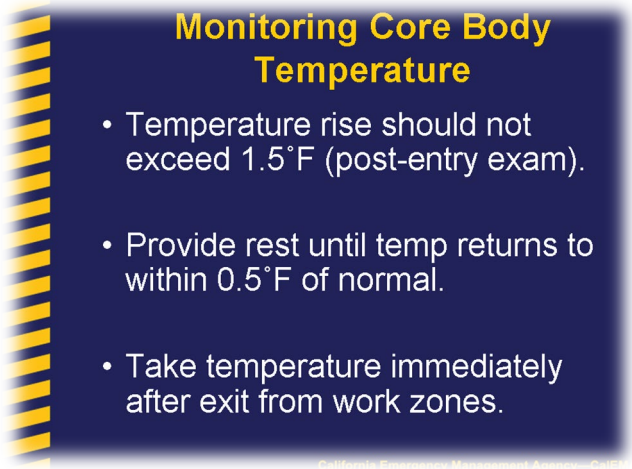
Core body temperature is the operating temperature of an organism, specifically in deep structures of the body such as the liver, in comparison to temperatures of peripheral tissues, such as skin.

Wearing encapsulating suits and performing the heavy physical activity inherent to hazmat work increases the danger of developing heat disorders. In fact, the encapsulating suit may be the most dangerous environment encountered at a hazardous materials incident.

Severe heat stress can occur in less than 20 minutes, depending on the type of protective clothing worn, the physical condition of the responder, and the ambient temperature.

Core temperatures can continue to increase during wet decontamination, despite reports of "feeling cooler," and continue to rise after removal of the suit.

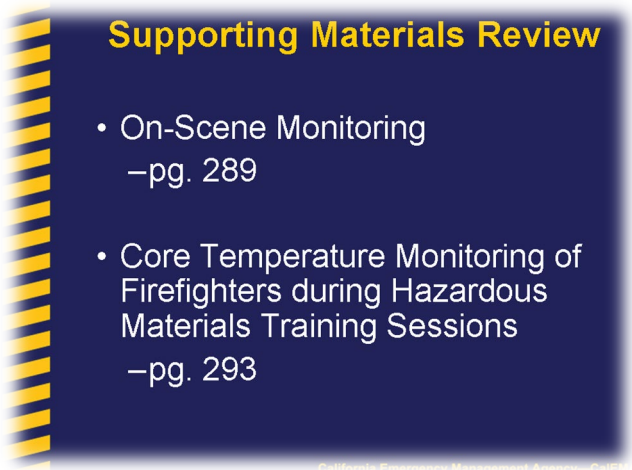
California Specialized Training Institute, 2019



Slide 6.18

Guidelines for monitoring core body temperature recommend:

- Maximum rise in temperature should not exceed 1.5˚F upon post-entry examination.
- No personnel should be permitted to continue working until their temperatures return to within 0.5˚F of normal.
- The temperature must be acquired as quickly as possible after the individual has exited the work zones.

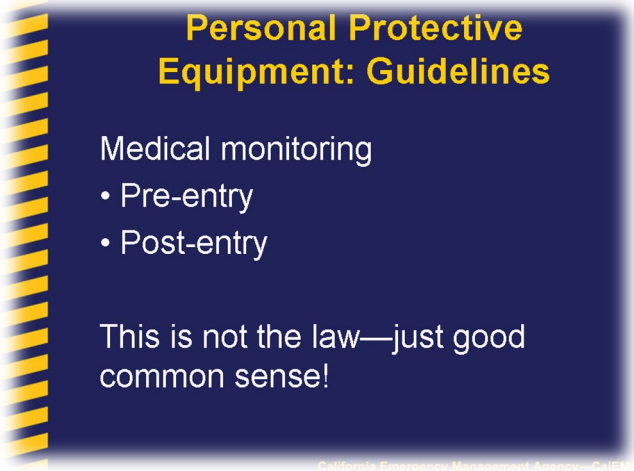


Slide 6.19

Review the listed supporting materials in the participant guide, pages 289 and 293.

"Core Temperature Monitoring of Firefighters during Hazardous Materials Training Sessions" is an article excerpt that brings attention to the fact that heat stress can occur very quickly and that core body temperatures continue to rise during wet decontamination and after work has been completed. It also illustrates the importance of monitoring and limiting suit time based on incident conditions.

California Specialized Training Institute, 2019



Slide 6.20

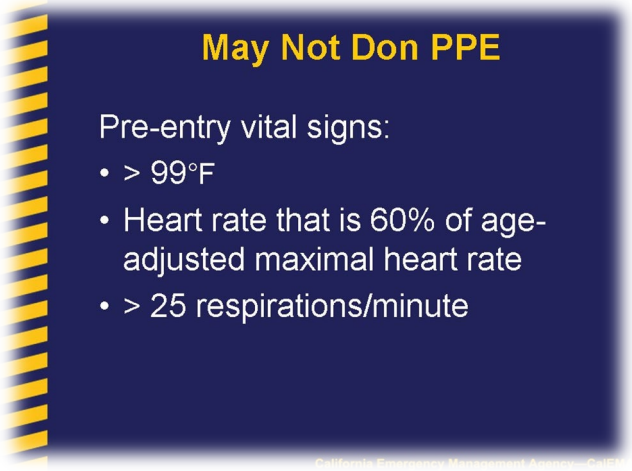
When hazmat responders are wearing personal protective equipment (PPE), medical monitoring should be conducted before entry into the control zones and again after exiting.

This is not the law, just good sense. (For more information, see OSHA's non-mandatory guidelines on PPE and the California Code of Regulations Title 8–Section 5192 [General Industry Safety Orders]).

Monitoring vital signs provides the best method to prevent or identify physiological conditions. Obviously, the backbone of the program rests with assigning critical values that identify any symptoms before they become serious.

Consider the following questions.

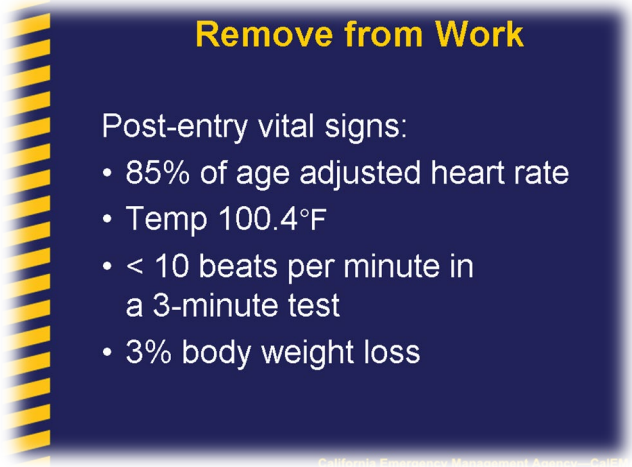
- What are the vital signs that indicate a team member should not be allowed to don chemical protective clothing?
- What are the vital signs that indicate a worker should be kept out of work zones until rehabilitated?
- What actions are needed to ensure responder safety?



Slide 6.21

If a responder's vital signs at pre-entry indicate a temperature that is greater than 99°F, a heart rate that is 60 percent of the age adjusted maximal heart rate, and respirations that exceed 25 per minute, then he or she should *not* be allowed to don chemical protective clothing.

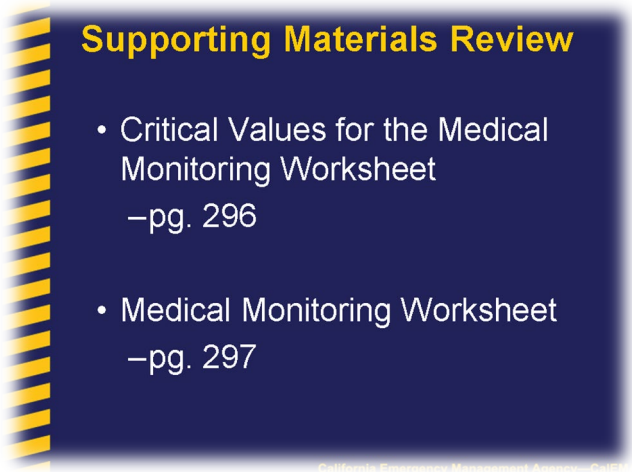
California Specialized Training Institute, 2019



Slide 6.22

A responder should *not* be allowed to return to work if any one of his or her vital signs at post-entry indicate a:

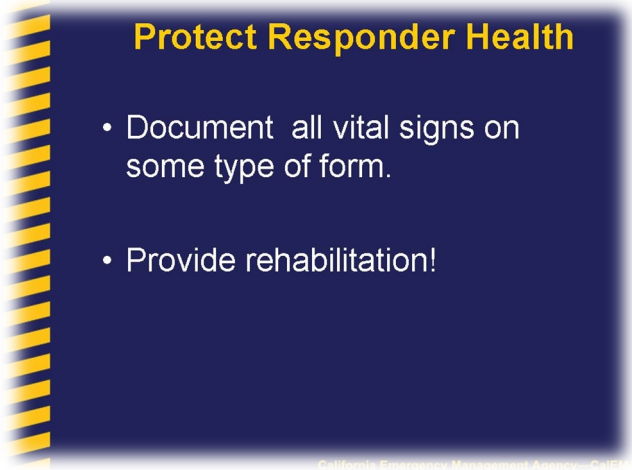
- 85 percent of age adjusted heart rate
- Temperature that is 100.4°F or higher
- Decrease of 10 heart beats per minute in a three-minute test
- Body weight loss of 3 percent



Slide 6.23

Review the listed supporting materials in the participant guide, pages 296 and 297.

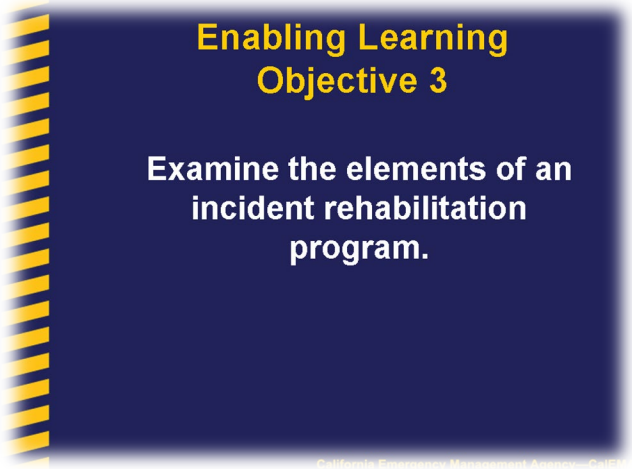
Remember that the Medical Monitoring Worksheet is an important tool for ensuring responder health and safety.



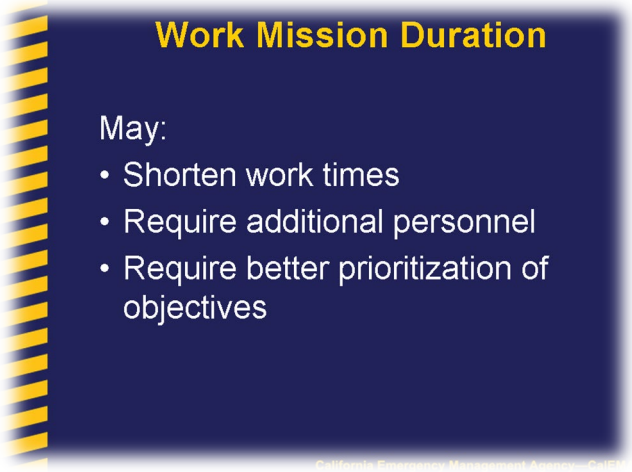
Slide 6.24

Monitor vital signs, document vital signs, and provide rehabilitation!

California Specialized Training Institute, 2019



Slide 6.25



Slide 6.26

Before personnel actually begin work in their PPE, the duration of the work mission should be estimated. Several factors limit mission length:

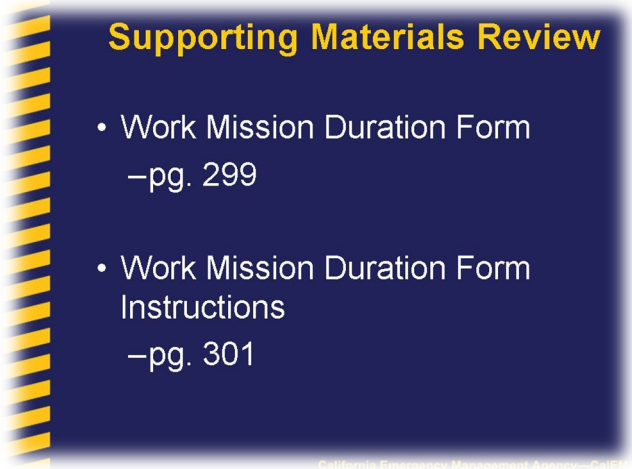
- Air supply availability and consumption
- Garment permeation or penetration by chemical contaminants
- Ambient temperature
- Suit cooling supply
- Time required to don/doff PPE
- Amount of physical work expected
- Physical condition of the wearer
- Travel time to the location and back to the decontamination area

The duration of the work mission may:

- Shorten work times
- Require additional personnel
- Require better prioritization of objectives

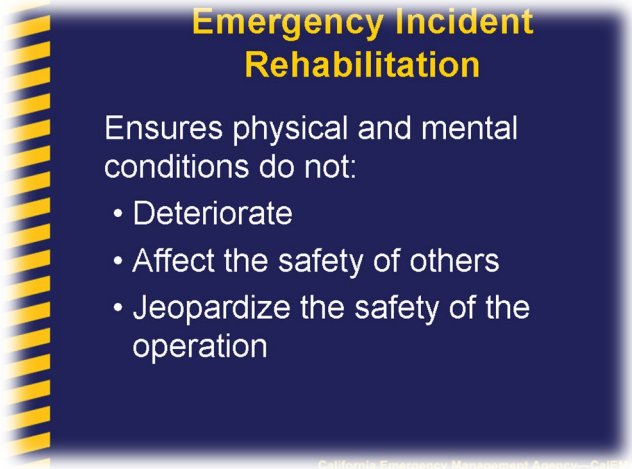
Special attention to monitoring of emergency response personnel should occur as air-time and entry times increase.

California Specialized Training Institute, 2019



Slide 6.27

Review the listed supporting materials in the participant guide, pages 299 and 301.



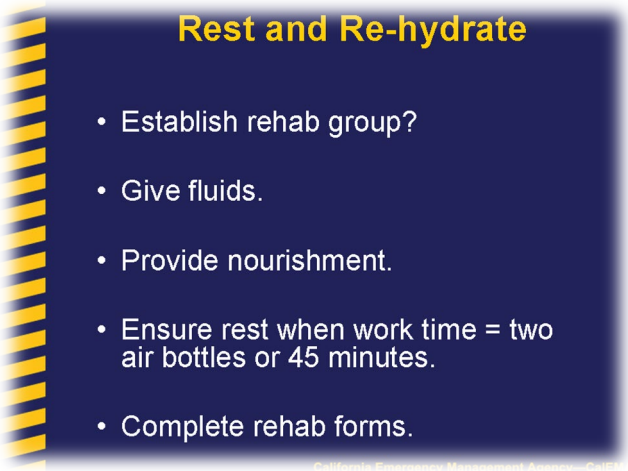
Slide 6.28

The physical and mental demands associated with response to hazardous materials incidents, coupled with the physical dangers associated with wearing PPE, create conditions that can adversely affect the safety and health of hazmat responders.

Rehabilitation is an essential element of incident response. It helps prevent serious health conditions from developing, such as heat exhaustion, heat stroke, or impaired judgment. Equally important, it helps ensure the safety of other responders.

When hazmat responders are given regular and adequate time to rest and rehydrate and their vital signs are within normal limits, they may safely reenter the operations scene and reduce the need for additional staffing.

California Specialized Training Institute, 2019



Slide 6.29

It may be necessary to establish a rehab group to supervise and effectively monitor personnel rehabilitation activities.

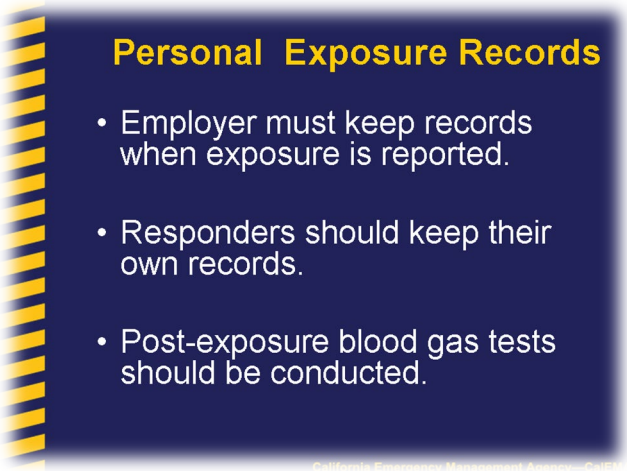
Fluid loss is an element of heat stress management that cannot be made up quickly. A good rule of thumb for fluid replacement is to administer the equivalent amount of fluid weight as was lost through the incident activity.

When units are engaged for three or more hours, nourishment should also be provided to responders.

Providing adequate rest periods between work missions is just as important as limiting work mission duration.

The Environmental Protection Agency has established guidelines for responder rehabilitation times. Drills and training exercises can be used as an avenue to measure and test rest period durations in given environments.

Regardless of how an agency determines adequate rest periods, the time frames must be predicated upon measurable factors, such as the anticipated work levels, environmental conditions, type of protective garments, individual workers' characteristics and fitness, and medical monitoring results.



Slide 6.30

Uncertainty often is the hallmark of exposure to hazardous substances by emergency responders. For example, what exactly was the substance composed of? in what concentrations? When will the effects of exposure appear?

Employers must keep records when exposure is reported. These records must include the employee's name and social security number, physician's comments (written opinions, recommended work limitations, results of examinations and tests), and employee medical complaints related to the exposure. The employer provides a copy of this information to the physician. A policy to conduct medical evaluations following suspected exposures should also exist.

It is also important for responders to keep their own records.

Blood gas tests should also be performed as soon as possible after exposure. If an emergency responder dies several days after exposure, blood gases may have returned to near normal and evidence may no longer exist during an autopsy to prove a chemical injury.

California Specialized Training Institute, 2019



Slide 6.31

Review the listed supporting materials in the participant guide, pages 303, 305, and 515.

This information, especially the SOP, provides more detail on incident rehabilitation.



Slide 6.32

The primary mission of the ASO-HazMat is to ensure the health and safety of incident responders. To that end, the ASO-HazMat must ensure that personnel monitoring is conducted before, during, and after an incident, and that all aspects of monitoring are in place and current.

Moreover, as an ASO-HazMat, you must expect the unexpected. During an incident, you must think safety at all times, under all circumstances. Complacency can jeopardize your safety and the safety of others in your care.

California Specialized Training Institute, 2019

Chapter 6



Supporting Materials/ resource List

Personnel Monitoring

The primary mission of the Assistant Safety Officer-Hazardous Materials (ASO-HazMat) is to protect the health and safety of all responders in an incident involving hazardous materials. Personnel monitoring is a critical tool for protecting responders' health and safety. As a result, the ASO-HazMat must ensure that all aspects of personnel monitoring are in place and current, and that personnel monitoring occurs before, during, and after an incident.

Monitoring begins with verification of proper baseline physical information. Personnel monitoring also includes on-scene medical monitoring, provisions for rehabilitation, and recording information about exposure, or suspected exposure, to hazardous materials. This chapter will discuss the components of a good Health and Safety Plan for monitoring incident personnel.

Protecting Worker Health and Safety

Any person who is expected by an employer to wear chemical protective clothing as a routine part of employment is entitled to a medical evaluation program (Title 29, Code of Federal Regulations, Part 1910.120 and California Code of Regulations Title 8, Section 5192). Personnel monitoring should be a part of the Site Safety Plan at any hazardous materials incident. Two types of programs are designated in Title 29, Code of Federal Regulations, 1910.120: baseline medical exams and on-scene field monitoring programs.

In terms of medical monitoring, personnel are divided into two categories. The first category includes employees who respond to hazardous materials incidents as a regular, expected function of their employment. These employees must receive baseline medical examinations, and should receive pre-entry and post-entry monitoring. The second category of employees includes those who *do not* respond to hazardous materials incidents as a regular, expected function of their employment. These employees should receive pre-entry and post-entry medical monitoring when wearing personal protective equipment (PPE) at a hazardous materials event. Skilled support personnel fall into this latter category.

California Specialized Training Institute, 2019

Baseline Medical Examinations

Baseline medical examinations begin when personnel are assigned to the hazardous materials team. The baseline physical establishes an individual's condition prior to assignment. The minimum content and procedures are governed by Title 29, Code of Federal Regulations, 1910.120 and the California Code of Regulations, Title 8 Section 5192(f), but vary by local jurisdiction and medical authority.

At a minimum, the medical examination must include a medical history and work history that include previous exposure and symptoms related to hazardous materials, and a statement regarding the employee's fitness for duty. In addition, the exam must address fitness to wear PPE. Following the evaluation, the physician provides the employer with a written assessment of the employee's fitness for duty.

The results of these examinations are confidential. The physician retains these personal medical records, which are covered under the Health Information Portability and Accountability Act (HIPAA). Subsequent, regularly scheduled physical examinations follow the baseline physical. Local jurisdictions also specify the content and procedures of these examinations. The employer must bear the cost of all baseline and follow-up medical examinations. Medical records for hazardous materials workers must be maintained for 30 years after the end of employment.

Title 29, Code of Federal Regulations, 1910.120 and the California Code of Regulations, Title 8 Section 5192, specify the following schedule for medical examinations:

- Prior to assignment
- At least once every 12 months, unless a medical authority specifies a longer period (but not to exceed a period of 24 months)
- At termination of employment or reassignment of the individual
- As soon as possible upon notification by an employee of exposure to hazardous materials beyond the acceptable exposure limits
- At more frequent intervals, as determined by a medical authority

California Specialized Training Institute, 2019

On-Scene Monitoring

Workers who respond to a hazardous materials incident may be exposed to toxic chemicals, safety hazards, biologic hazards, and radiation. A Site Safety Plan should be developed for each site based on the specific needs, location, and potential exposures of responders at the site.

Field Monitoring

At the very least, field monitoring must address temperature, relative humidity, and wind speed. These components define the minimum environmental parameters at the site. Temperature, relative humidity, and wind speed can greatly affect the health and well-being of on-scene emergency response personnel.

Part of the Health and Safety Plan should include procedures for monitoring the environment, including airborne, waterborne, or soil-borne contaminants, to ensure the safety of responders, as well as the affected population. Chapter 8 will provide detailed information on environmental monitoring.

Medical Monitoring

Emergency responders may feel pressured to work beyond their capability. These pressures to overextend may come from supervisors, from peers, and from responders' own personal motivations. These pressures may cause responders to work even when it is no longer safe for them to do so. Moreover, working in chemical protective clothing is inherently dangerous. That is why guidelines for on-scene medical monitoring are so important. These guidelines help ensure worker health and safety, and reduce the chance that individuals may exceed their physical limitations.

Following set guidelines may shorten the work time for individual team members and require that additional trained responders be available. Medical monitoring may also increase the time between entries, and increase the time needed for re-hydration, rest periods, and temperature recovery. This may also affect the number of responders needed. As a result, it is critical to set clear priorities and objectives in assigning personnel to the various zones.

Pre-entry and Post-entry Assessments

Medical monitoring should be initiated both before entry into the control zones and again after exiting. The EMS or medical unit is responsible for the execution of, or the supervision of, medical support for hazardous materials responders. Monitoring vital signs provides the best method to prevent or identify physiological conditions. Obviously, the backbone of the program rests with assigning critical values that identify any symptoms before they become serious.

General health is an overall indicator of the responder's fitness for stressful working environments. Take into consideration responders' general physical appearance and identify those who haven't been feeling well lately. Neurological status can be an early indicator of stress and/or exposure, especially in the post-entry evaluation. Checking a person's level of consciousness may give an indication of trouble.

California Specialized Training Institute, 2019

Tracking Heat Stress

Heat-related illnesses are a major cause of injuries to hazardous materials emergency responders. Advances in medical science have altered our understanding of what constitutes heat illnesses and which indicators accurately measure heat stress. In the past, we believed that the best indicators of heat stress were temperature, heart rate, and blood pressure. We now know that more accurate measures of heat stress are water weight loss, core body temperature, and heart rate. An effective medical monitoring program should include assessments of these essential factors.

Water Weight Loss

Responders wearing chemical protective clothing may lose 3.5 liters of body fluid per hour through sweat. Fluid loss cannot be quickly regained. Fluid metabolism is a slow process that must occur throughout the day to be truly effective. A good rule of thumb for fluid replacement is to administer the equivalent amount of fluid weight that was lost through activity while on the incident.

Thirst is a deceptive indicator of the need to replenish fluids. (A responder may not feel thirsty, but may still have lost too much body fluid.) Don't guess. Rely on a measurable index. Use a scale that is accurate to within one-quarter of a pound to measure body weight loss.

Parameters for suggested water weight loss are

- Body weight loss should not be allowed to exceed 1.5 percent of total body weight.
- A 3 percent loss of body weight should require that the individual be immediately removed from all duties, pending a thorough assessment by a qualified medical authority.
- A 5 percent loss of body weight should require that the individual be immediately transported to the nearest medical facility for a thorough assessment.

Take extra care when measuring post-entry body weights. Post-entry assessment is intended to weigh the amount of fluid remaining in body tissues. Weigh individuals *before* they have re-hydrated and *after* they have removed any sweat-soaked garments. Liquid that has pooled in the stomach or is clinging to the body as sweat—and therefore yields a false measure of weight—may mask a serious condition. Make sure the post-entry weight is a "dry" one.

Core Body Temperature

Core body temperature is the operating temperature of an organism, specifically in deep structures of the body such as the liver, in comparison to temperatures of peripheral tissues, such as skin. The most common way of measuring body temperature is by using an oral thermometer. However, single readings or oral temperature may not be accurate enough to rely on for determining responder well-being.

The best method for accurately determining an individual's temperature rise is by establishing a baseline prior to the event and comparing that temperature to the post-entry temperature reading. Baseline temperatures are acquired by measuring an individual's temperature every day over a two-week period. However, this is not always an easy task.

These guidelines are helpful for monitoring core body temperature:

- A maximum rise in temperature should not exceed 1.5˚F upon post-entry examination.

California Specialized Training Institute, 2019

- No personnel should be permitted to continue working until their temperatures return to within 0.5˚F of normal.
- To be valid, the temperature must be acquired as quickly as possible after the individual has exited the work zones.
- Tympanic temperature readings (taken through the eardrum) are a good indicator of body core temperatures and are relatively easy to acquire. However, storage temperatures and temperature fluctuations may render tympanic thermometers unreliable in the field.

Pulse (Heart Rate)

Your pulse is the best indicator of the overall stress being applied to the body. The most widely accepted pulse measurement is known as the *age-adjusted maximum heart rate.* This number represents the limit to which an individual can maintain aerobic exercise for extended periods without damaging the heart muscles. However, personnel should never exceed this number. To figure the age-adjusted maximum heart rate, subtract the individual's age from the number 220. *(Note: Refer to the Critical Values for the Medical Monitoring Worksheet.)*

Blood Pressure

Blood pressure is the force of the blood on blood vessel walls as the heart beats and relaxes. Heat stress may not immediately affect blood pressure. It is worth tracking because it is a measurement of the "quality" of rest by the heart muscle between each stroke.

California Specialized Training Institute, 2019

Core Temperature Monitoring of Firefighters during Hazardous Materials Training Sessions

Note: This article excerpt discusses the fact that heat stress can occur very quickly (within 20 minutes), core body temperatures continue to rise even when a responder is in a wet decontamination suit or after work has been completed, and suit time must be monitored and limited based on incident conditions.

The original article appeared in *Prehospital and Disaster Medicine* [1996. Apr-Jun;11(2):108-11.], and written by Roger Menze, MD; Mary Jo McMullen, MD, FACEP; Lynn J. White, MS; and James M. Dougherty, MD, FACEP.

Materials and Methods

This study was approved by the Institutional Review Board and took place at hazardous materials (hazmat) training sessions conducted in the Midwest during the summer of 1994. Nine hazmat technicians volunteered for core temperature (Tc) monitoring.

All study participants were certified as firefighters and paramedics and received specialized training in the handling of hazardous materials. Standard medical evaluations for the study participants included biannual physical examinations and on-scene pre-entry history and physical examinations in compliance with recommended occupational medicine surveillance requirements.

Firefighters volunteering for the study were equipped with Level A fully encapsulated, chemical resistant suits (FECRSs). Level A equipment offers the highest level of protection available according to Environmental Protection Agency standards.

Study participants swallowed the CorTempTM capsule during examinations, which was done before they donned the suit. Eight ounces of room-temperature rehydrating fluid were given to aid in swallowing the capsule and to fulfill pre-suit hydration requirements. Beneath the FECRSs, volunteers wore bandoleer antennas that transmitted the readings to a recorder unit strapped to the outside of their left legs. Core temperature was monitored and data was recorded at 30 second intervals for the duration of the entry. Subjects were monitored by the Hazardous Materials Safety Officer, who observed them with binoculars and maintained two-way radio communications with each subject.

results

Nine male volunteers participated in the study, which took place between June and September 1994 in the Midwestern US. Average ambient temperature during the monitoring period was 24.4º C (76º F) [range 20.5–28.9º C (69-89º F)] and weather conditions included both sunny and rainy days.

The mean age of the subjects was 34 years (range 24 to 44 years), mean weight was 92.6 kg (range 77.7 to 109.1 kg), average baseline Tc was 36.7º C (98.1º F) [range 35.9–38.2º C (95.5-100.7º F)]. Mean time in the FECRSs was 25.4 minutes (range 14–35 minutes). All subjects demonstrated increases of Tc during the time in the suit: the mean increase of Tc was 0.8º C (1.3º F) [range 0.2-1.3º C (0.4-2.3º F)].

California Specialized Training Institute, 2019

The mean high Tc recorded while the subjects were in their suits was 37.8º C (100.7º F). Thermal stress is expressed as heat storage values were calculated. The mean heat storage value was 4.0 kl/kg (range 2.1–4.6 kl/kg).

discussion

While persons are wearing encapsulating suits and performing heavy physical activity inherent to hazmat work, the danger of developing heat disorders becomes very real. Laboratory simulations testing various types of protective fire gear have shown that severe heat stress can occur in less than 20 minutes, depending on the type of protective clothing worn, the physical condition of the firefighter, and the ambient temperature. This study was designed to evaluate Tc fluctuations in individuals performing actual reconnaissance, repair, or rescue tasks during a simulated incident. No attempt was made to quantify workload or to compare each individual with a control. The objective was to demonstrate Tc fluctuations in these workers as they occur in the field, and to determine the feasibility of using this technology to document temperature changes in these individuals. Although it is well known that heat exhaustion and heat stroke are extremely dangerous to hazmat workers and others at the scene of an incident, there is no accepted method of predicting the occurrence of these hazards or even of detecting real-time temperature elevations in these high-risk emergency medical services personnel.

U.S. Occupational Safety and Health Administration standards, designed to protect factory workers and others with long-term exposure to high-temperature environments, state that Tc exceeding the baseline temperature of 37º C by 1º C or more are outside the acceptable range. It remains unclear whether this parameter defines a limit that also pertains to workers, such as firefighters, who typically experience significant increases in Tc in a very short period of time. Short-term tolerance to heat stress in this specialized group may be less than that found in the groups of acclimatized factory workers who most often are the subjects of occupational safety surveillance.

Despite the knowledge that increases in Tc can be deadly, there never has been a study or method of recording Tc of hazmat personnel during an incident. Although all of our subjects demonstrated increases in Tc, none experienced heat exhaustion or heat stroke. Reasons for this might include strict adherence to pre-screening criteria, pre-suit hydration requirements, and vigilant safety monitoring of personnel engaged in the training scenarios. The monitors adhered closely to published time limitations, and were cognizant of the effects that prolonged time in direct sunlight would have on the subjects. For these reasons and because weather conditions were relatively mild, the appearance of extreme Tc elevations during this study may have been prevented.

Core temperatures continued to increase during wet decontamination despite subjective reports of "feeling cooler," and continued to rise after removal of the suit. This provides further evidence to support strict time limitations while one is wearing a FECRS.

Measures that would minimize heat accumulation within encapsulating suits include the provision of adequate pre-suit hydration and strict adherence to time limitations. Avoiding direct sunlight, minimizing unnecessary time in the suit by allowing workers to keep their suits open or partially off until the last possible moment, and limiting strenuous physical activity during the entry are additional protective measures that easily could be implemented. Cooling vests are currently under study. They may be helpful if they can be designed at a minimum weight and bulk to be practical for use under a FECRS.

California Specialized Training Institute, 2019

The practicality of using the CorTemp^{TM} system currently is limited to research for this hazmat team, because of the cost of monitoring individuals in real time. In this study, the data were not available until the subject removed the suit and the researcher downloaded the data to a computer. To be practically beneficial, the system would require the capability to transmit real-time data directly to an officer in the safety zone. Although this technology is available, it was beyond the financial resources available for this study.

Conclusion

These observations indicate that Tc monitoring can be accomplished for individuals wearing Level A FECRSs. As all individuals in this study experienced moderate elevations in Tc, it is recommended that every available precaution to prevent heat-related disorders and their sequelae be taken for these vulnerable individuals.

California Specialized Training Institute, 2019

Critical values for the Medical Monitoring Worksheet

Weight	3% Loss	5% Loss
130	126	124
135	131	128
140	136	133
145	141	138
150	146	143
155	150	147
160	155	152
165	160	157
170	165	162
175	170	166
180	175	171
185	179	176
190	184	181
195	189	185
200	194	190
205	199	195
210	204	200
215	209	204
220	213	209
225	218	214
230	223	219
235	228	223
240	233	228
245	238	233
250	243	238
255	247	242
260	252	247
265	257	252
270	262	257
275	267	261
280	272	266
285	276	271
290	281	276
295	286	280
300	291	285

Age	MHR	85% MHR	60% MHR
20	200	170	120
21	199	169	119
22	198	168	119
23	197	167	118
24	196	167	118
25	195	166	117
26	194	165	116
27	193	164	116
28	192	163	115
29	191	162	115
30	190	162	114
31	189	161	113
32	188	160	113
33	187	159	112
34	186	158	112
35	185	157	111
36	184	156	110
37	183	156	110
38	182	155	109
39	181	154	109
40	180	153	108
41	179	152	107
42	178	151	107
43	177	150	106
44	176	150	106
45	175	149	105
46	174	148	104
47	173	147	104
48	172	146	103
49	171	145	103
50	170	145	102
51	169	144	101
52	168	143	101
53	167	142	100
54	166	141	100

Vital Sign	Point at Which Responders Should Be Removed from Work
Body Temperature	> 38˚C (100.4˚F)—This is an OSHA requirement
Pulse	> 85% of the maximum heart rate (Maximum 220-age)
	> 110 beats per minute while the individual is at rest
Heart rate recovery	< 10 beats per minute * 3 minute test
Body weight loss	> 3%
Other	Other signs/symptoms of heat-related illness (e.g., skin temperature and cardiac rhythms)

California Specialized Training Institute, 2019

Medical Monitoring Worksheet

Name	Age	Pre-entry					Post-entry						Critical Values *				
		Pulse	Temp	Wgt	BP	Resp	Pulse	Temp	Wgt	BP	Resp	Pulse 3 Min	MHR	85% MHR	60% MHR	3% Wgt	5% Wgt

Prepared by: _____

Position: _____

Agency: _____

Key:

BP = Blood Pressure, Wgt = Weight,
MHR = Maximum Heart Rate (220—Age)

* See chart on back for these values.

Work Mission duration Form and Instructions

Use these instructions to complete the Work Mission Duration Form.

1. **Air Supply:** Across the top of the form are standard air supplies (30/45/60-minute air bottles and umbilical air). When completing the form, enter information into the column that corresponds to the air supply being used by the hazmat team.
2. **Safety Factor:** A standard rule of thumb is that personnel should be able to perform the task, exit the zone, complete decontamination, and begin doffing before the low-air alarm bell sounds. On most SCBAs, the bell will alarm with approximately a 5-minute reserve. Therefore, 5 minutes is an acceptable standard entry in this portion of the form.
3. **Travel Time:** This should be a close estimation of the travel time to and from the site.
4. **Environmental Conditions:** Environmental conditions impact emergency response personnel before they don PPE, while they are working, and after they doff the garments. Temperature and humidity are the primary factors to be concerned about. The recommended entries are as follows:

Entry	Environmental Condition
0	Cool and Dry
5	Warm and Moist
10	Hot and Wet

5. **Work Load:** The type of work is another measurable factor. The greater the work load, the greater the impact. The recommended entries are as follows:

Entry	Work Load
0	Light
5	Moderate
10	Heavy

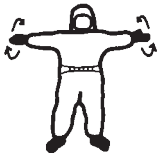
6. **Decontamination:** Decon takes time to accomplish. The more people who need decontamination, the more time will be required. The number entered into this row should account for the time that it takes to decontaminate *all* team members.
7. **Other:** This row provides a place to account for other factors that impact air supply, such as age, obesity, or personal habits.
8. **Operating Work Time:** The estimated operating work time is entered at the bottom of the form. To determine the operating work time, add the entries from all the previous rows, then subtract that number from the total air supply available.

California Specialized Training Institute, 2019

Work Mission duration Form

Incident Name:_____Date:_____Location: _____

 Out of Air	Air Supply	30 Minutes	45 Minutes	60 Minutes	Umbilical Air
	Safety Factor				
 Need Help	Travel Time (times 2)				
	Environmental Conditions (L-0, M-5, H-10)				
 Evacuate	Work Load (L-0, M-5, H-10)				
	Decontamination (maximum)				
 O.K.	Other				
	Operating Work Time (To be amended during incident, as dictated by actual air supply)				

 Need Assistance with Repair	Recommended Work Time (Between Rest Periods)* When wearing impermeable or semi-impermeable Chemical Protective Clothing			
	Air Temperature (Maximum)	Sunshine (Radiant Heat Exposure)		
		Full Sun	Partly Sunny	Full Shade
 Situation Under Control	70° F	60 min. of work	90 min. of work	120 min. of work
	75° F	30 min. of work	60 min. of work	90 min. of work
	80° F	20 min. of work	30 min. of work	60 min. of work
	85° F	15 min. of work	20 min. of work	30 min. of work
	90° F	15 min. light work	15 min. of work	20 min. of work
	95° F	Extreme Danger	Danger	15 min. of work
	* Reference: Occupational Safety & Health Administration (OSHA) Guidance Manual for Hazwaste Site Activity (Table 8-10)			

California Specialized Training Institute, 2019

Personnel rehabilitation

The physical and mental demands associated with responding to hazardous materials incidents, coupled with the physical dangers of wearing chemical protective clothing, create conditions that can adversely affect the safety and health of responders. Personnel who are not provided with adequate opportunities to rest and re-hydrate during emergency operations or training exercises are at increased risk for illness or injury. This can also jeopardize the safety of others on the incident scene. Rehabilitation is an essential element of a Health and Safety Plan and helps prevent more serious conditions, such as heat exhaustion or heat stroke. After hazardous materials responders have been given regular and adequate time to rest and re-hydrate, they may safely reenter the operations scene and reduce the need for additional staffing.

The Assistant Safety Officer-Hazardous Materials should be familiar with two important sources of information on the on-scene care of emergency responders: the National Fire Protection Association's *Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises* (NFPA 1584) and the U.S. Fire Administration's *Emergency Incident Rehabilitation*.

Rehabilitation Area

A rehabilitation area may be set up when rest and rehabilitation are needed for personnel operating at an incident scene or during training. The rehabilitation area should be located in an area that will provide physical rest by allowing the body to recuperate from the demands and hazards of the emergency operation or training. The rehabilitation area should be far enough away from the scene so that responders can safely remove their protective clothing and SCBA. The rehab area should also provide respite from the mental stress and pressure of the emergency operation or training.

The rehabilitation area should provide protection from the environment. For example, during hot weather, it should be in a cool, shaded area. During cold weather, it should be in a warm, dry area. It should be free of exhaust fumes from apparatus, vehicles, or equipment (including those involved in the rehabilitation sector/group operations).

The rehabilitation area should be large enough to accommodate multiple crews, based on the size of the incident. It should be easily accessible by EMS units and allow prompt reentry back into the emergency operation upon complete recuperation.

When units are engaged for three or more hours, nourishment should also be provided to responders. In addition to fluids (such as water and electrolyte solutions), cups of soup, broth, or stew are highly recommended because these dishes are digested much faster than sandwiches and fast-food products. In addition, foods such as apples, oranges, and bananas provide supplemental forms of energy replacement. Fatty and salty foods should be avoided.

Rest Periods

As mentioned earlier, guidelines for medical monitoring may shorten the time that individual team members may work and increase the time between entries. Providing adequate rest periods between work missions is just as important as limiting the duration of work missions. Responders should re-hydrate (at least eight ounces) while SCBA cylinders are being changed. Hazmat entry teams that have worked for two full

California Specialized Training Institute, 2019

30-minute rated bottles, or 45 minutes, should be directed to the rehabilitation area for rest and medical evaluation.

Adequate rest periods must be predicated upon measurable factors, such as the anticipated work levels, environmental conditions, type of protective garments, individual workers' characteristics and fitness, and medical monitoring results. Rest periods should be at least ten minutes and may last longer than an hour, as determined by the rehab officer. Fresh crews, or crews released from rehabilitation, should be available at a personnel staging area to ensure that fatigued members are not required to return to duty before they are rested, evaluated, and released.

Drills and training exercises provide excellent opportunities to measure and test the adequacy of rest periods in specific environments. In addition, the Occupational Safety and Health Administration has established a set of guidelines on responder rehabilitation times that are based on research of endurance rates.

For more information on rehabilitation, see Appendix B, the United States Fire Administration's sample Emergency Incident Rehabilitation Standard Operating Procedure.

California Specialized Training Institute, 2019

Personal Exposure records

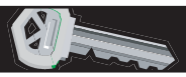
The effects of exposure to hazardous materials may not become evident until years after the initial exposure. As a result, it is extremely important for emergency responders and their employers to keep accurate records of all exposures—and suspected exposures—regardless of degree. The burden of maintaining an effective medical surveillance program and accurate records rests with the employer. The following elements are required for each employee's record:

- Name and social security number
- Physician's comments:
  - Written opinions
  - Recommended work limitations
  - Results of examinations and tests
- Employee medical complaints related to exposure
- Copy of information provided to the physician by the employer

A policy to conduct medical evaluations following potential exposures should also exist. The effects of exposure to hazardous materials are divided into three categories: **immediate**, **delayed**, and **long-term.** Since the effects of exposure to hazardous chemical environments may not manifest themselves for many years following the exposure, conducting timely blood gas tests will, in cases of toxic chemical exposure, increase the likelihood of providing medical evidence of exposure and proper after-exposure care. Part of this evaluation should include a carboxyhemoglobin test. In the event of a death to an emergency responder occurring several days after exposure, blood gases may have returned to near normal and evidence may no longer exist during an autopsy to prove a chemical injury.

California Specialized Training Institute, 2019

Chapter 6



Practical Exercises

Practical Exercises 6.1: The Medical Monitoring Program

Directions: List the elements of an on-scene medical monitoring program.

Prior to First Entry

Prior to Second and Subsequent Entries

removal from Work

Vital Sign	Point at Which Responders Should Be Removed from Work

California Specialized Training Institute, 2019

Safety Messages, Safety Briefings, and Special reports



Scope

This chapter provides information on the preparation, production, and delivery of safety messages, safety briefings, and special reports during hazardous materials events.



Terminal Learning Objective (TLO)

At the end of instruction for Chapter 7, participants will be able to develop appropriate forms of written and oral safety communication for incident planning and to ensure that on-scene personnel receive critical information about the specific hazards and risks involved in hazardous materials incidents.



Enabling Learning Objectives (ELOs)

This chapter's enabling learning objectives are to ensure participants will be able to:

1. Create a safety message that alerts on-scene responders to an incident's specific hazards and risks.
2. Deliver a safety briefing on the dangers of an incident to appropriate personnel.
3. Develop special reports for hazardous materials incidents.

Supporting Materials/resource List

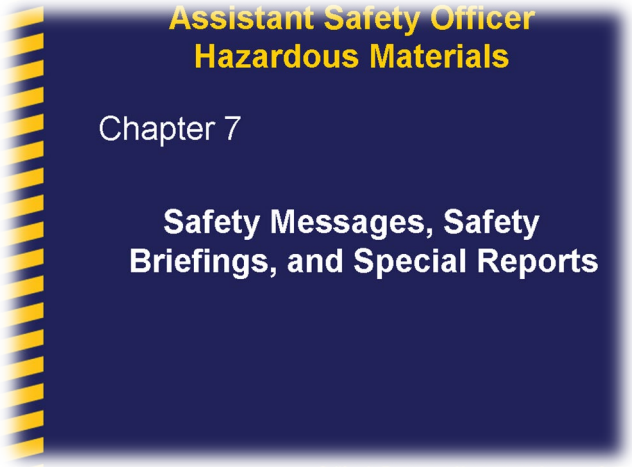
See Supporting Materials/Resource List section starting on page 321.



Practical Exercises

Note: No exercises are scheduled for this introductory chapter.

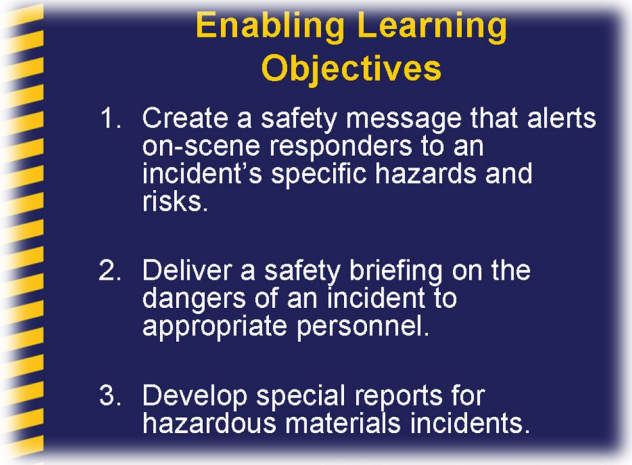
California Specialized Training Institute, 2019



Slide 7.1

The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

- (Res.A.2 1.3.2) Report current monitoring activities and results.
- (Res.A.3 3.4) Disseminate information to emergency managers and responders.
- (Res.B.1 16.5) Monitor and perform activities related to worker health and safety issues.



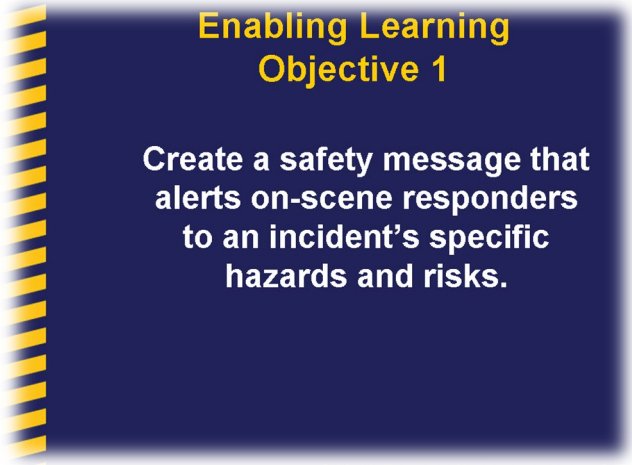
Slide 7.2

The goal (terminal learning objective) of this chapter is to ensure participants will be able to develop appropriate forms of written and oral safety communication for incident planning and to ensure that on-scene personnel receive critical information about the specific hazards and risks involved in hazardous materials incidents.

This chapter's enabling learning objectives are to ensure participants will be able to:

1. Create a safety message that alerts on-scene responders to an incident's specific hazards and risks.
2. Deliver a safety briefing on the dangers of an incident to appropriate personnel.
3. Develop special reports for hazardous materials incidents.

California Specialized Training Institute, 2019



Slide 7.3

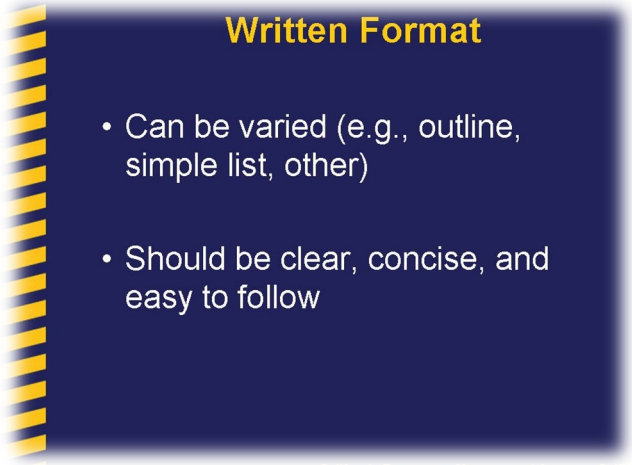


Slide 7.4

The SO and ASO-HazMat are responsible for providing information during incident planning and operations to ensure the safety of on-scene personnel. One way to present such information is through the written safety message.

The purpose of the safety message is to list observed or projected hazards and risks. That is, safety messages should address the hazards and risks that have loss potential or indicate trends toward potential accidents. Examples of potential hazards include long work hours and tired crews; slip, trip, and fall hazards; and rolling or falling debris.

Listing the hazards helps prepare and remind personnel to stay alert to the dangers that are specific to the incident.



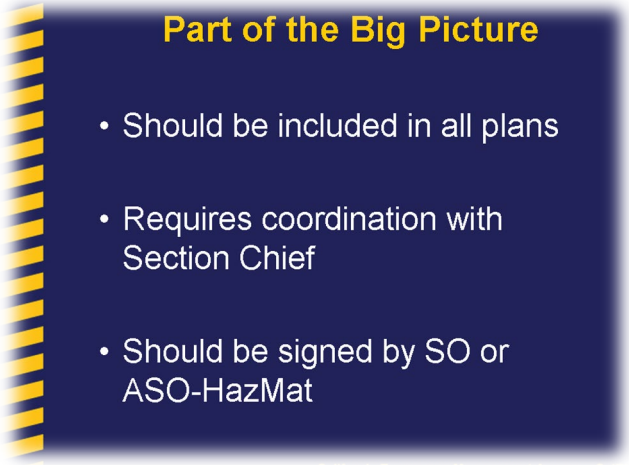
Slide 7.5

There is no absolute format for the safety message. It may be written as an outline, in paragraph form, or some other presentation. The format largely depends on individual style.

What's important is to ensure that the message is easy to follow and the language is clear and concise.

As an organizational tool, it helps to group information into logical areas, such as branch or division, functional area, or risk/hazard categories.

California Specialized Training Institute, 2019

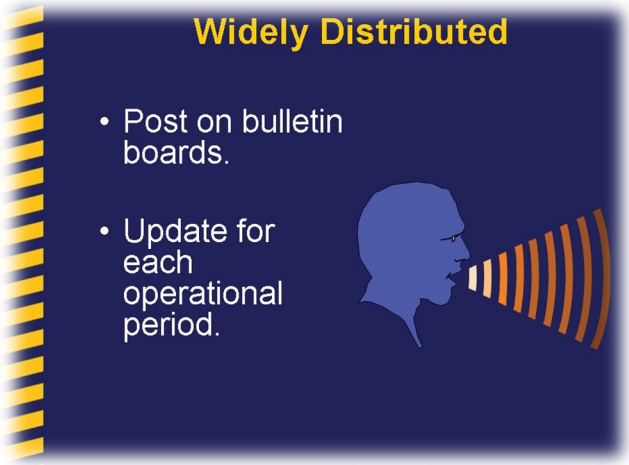


Slide 7.6

Safety messages should be included in all Incident Action Plans (IAPs). This will require that the SO or ASO-HazMat works closely with the planning Section Chief on timeframes for including the safety message in the IAP.

Safety messages also should be included in any plan that is handed out at the incident, such as Site Safety Plans.

All safety messages ***should*** be signed by the SO/ASO-HazMat.



Slide 7.7

Safety messages should be widely distributed, such as being posted on all bulletin boards.

Moreover, safety messages should be updated for each operational period so incident personnel have timely and accurate information on safety topics. For the first operational period, the safety message may be based on information from the initial briefing.

When writing updates, reorder the safety message's elements to keep responders' interest and to emphasize the message's key points.



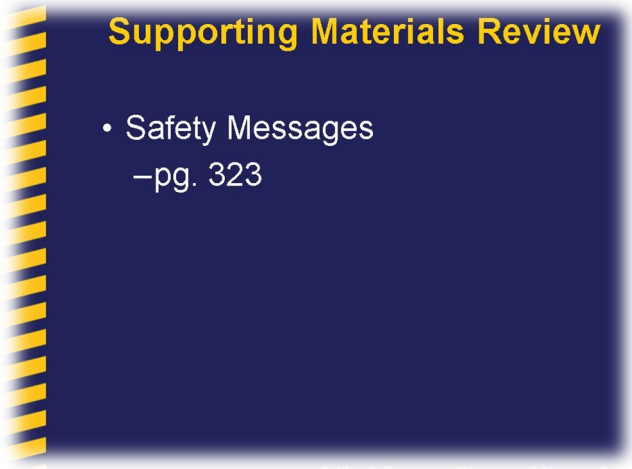
Slide 7.8

This diagram identifies the key points a safety message should include.

- Probability: What are the likely risks?
- Damage: Are minor or serious injuries likely to result?
- Narrative written in clear, concise prose: What is the problem?
- Attitude: Is the safety attitude addressed? Does the safety message remind responders to watch out for each other, to work in a buddy system, to keep a positive safety attitude?

Signature: In a hazmat incident the SO or ASO-HazMat should *always* sign the safety message.

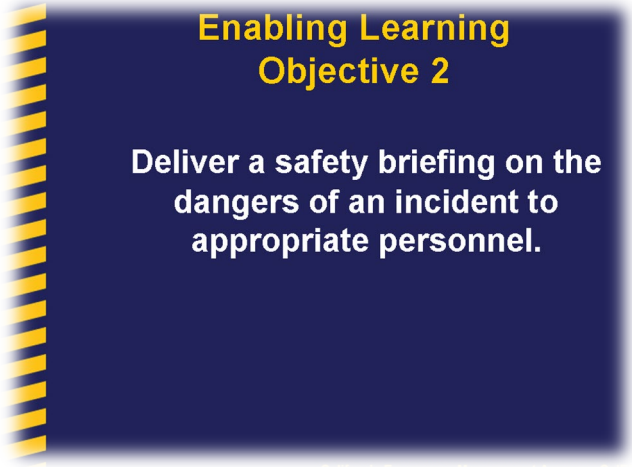
California Specialized Training Institute, 2019



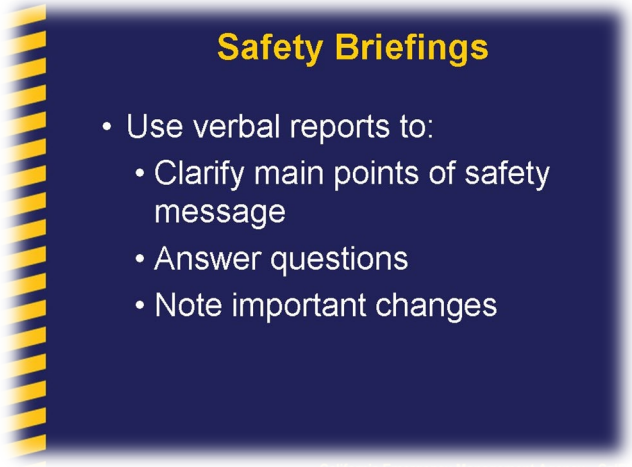
Slide 7.9

Review the listed supporting materials in the participant guide, page 323.

In particular, take time to thoroughly review the sample safety messages: **General Safety Message, Operational Safety Message**.



Slide 7.10



Slide 7.11

Safety briefings are verbal reports used to clarify or emphasize the main points of the safety message. These briefings are also used to answer any questions or note important changes that may have risen since the original message was prepared.

In some cases, especially when the situation rapidly changes, an incident may require more than one briefing.

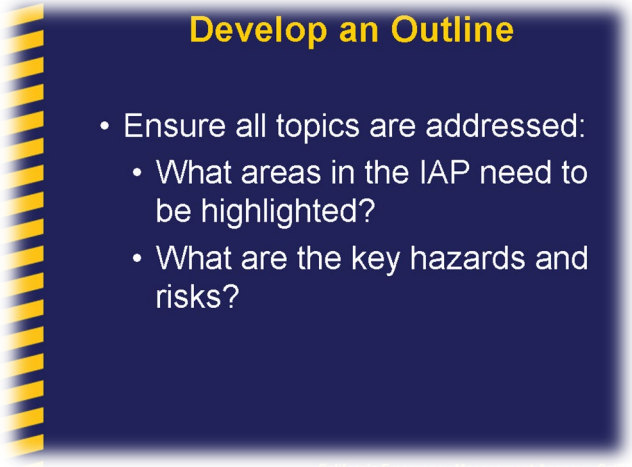
California Specialized Training Institute, 2019



Slide 7.12

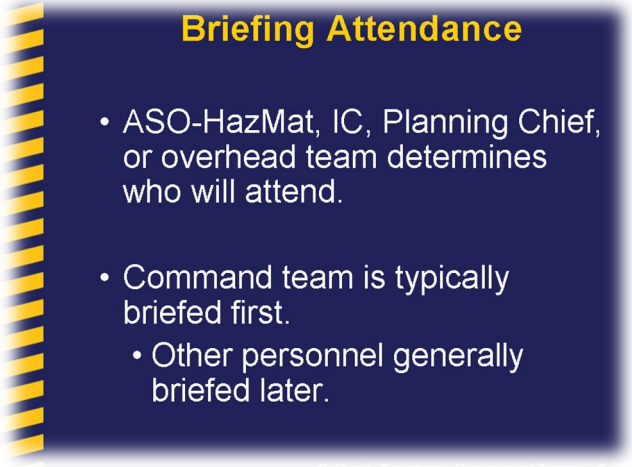
Safety briefings also are opportunities for the ASO-HazMat to ask questions. Asking questions often yields important information that might otherwise get overlooked.

Safety briefings also are an excellent opportunity for you to develop a rapport with incident personnel and to establish the need for safety.



Slide 7.13

A tried-and-true approach to preparing for a safety briefing is to create an outline of items that need to be covered. This way, you're less likely to forget any important points.



Slide 7.14

The ASO-HazMat, Incident Commander, Planning Section Chief, or the overhead team (when one is in place) should determine ahead of time the number and type of personnel to attend the safety briefing.

However, at hazardous materials incidents, *all* personnel should be briefed on the Site Safety Plan.

The command group receives the safety briefing before all line personnel do.

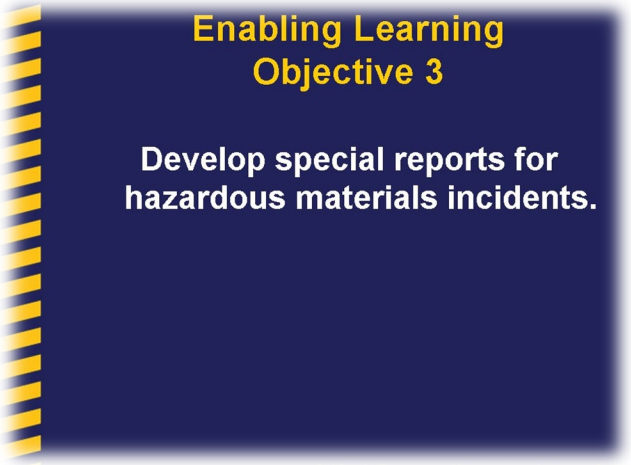
California Specialized Training Institute, 2019



Slide 7.15

In this video, an ASO-HazMat is delivering a safety briefing that addresses the key hazards and risks involved in responding to a chlorosulfonic acid spill in San Luis Obispo, CA.

- Did the team demonstrate good, two-way communication?
- Can the plan be altered, based on new intelligence?



Slide 7.16



Slide 7.17

The ASO-HazMat may be called upon to complete or help complete a variety of special reports. Some reports are "form reports" that require filling out specific agency forms.

Other reports are written as narratives that support form reports or document significant events, such as accidents and injuries.

A narrative report is a special report that requires a significant amount of written text, as opposed to simply filling in lines or boxes within a form.

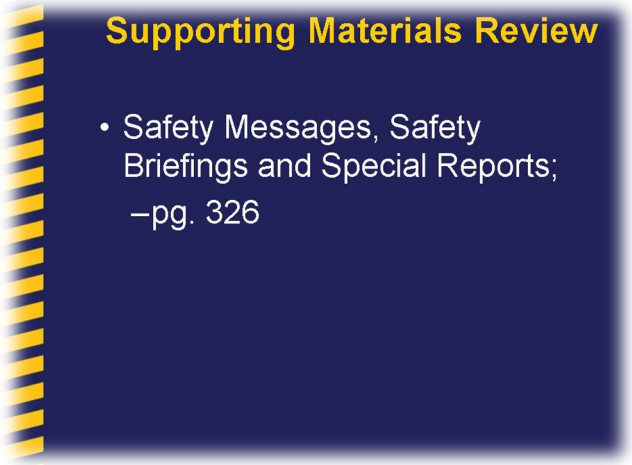
California Specialized Training Institute, 2019



Slide 7.18

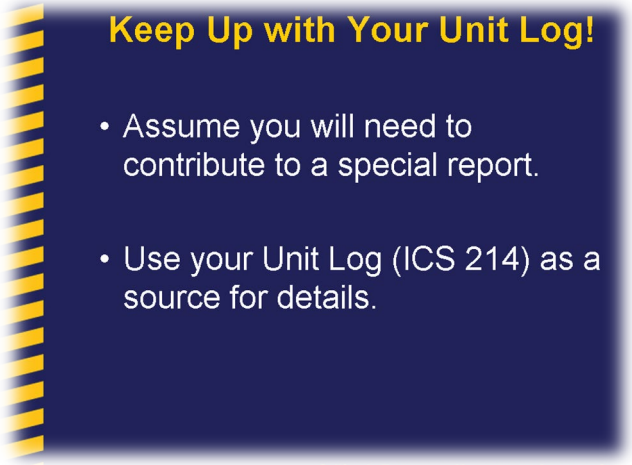
Special reports require a great deal of specific information. Items typically covered in a special report are

- Number of injuries
- General safety situations and problems encountered
- Description of significant incidents or unsafe situations
- Recommendations for correcting the problems
- Copies of injury and accident reports



Slide 7.19

Review the listed supporting materials in the participant guide, page 326, for a sample narrative report about the Aum Shinrikyo subway attack in Tokyo.



Slide 7.20

It is best to assume that you will have to write or contribute to a special report.

Use your Unit Log (ICS Form 214) as a source of details for special reports. To use the Unit Log for this purpose, you will have to ensure that you fill it in with specifics *as the incident unfolds*.

California Specialized Training Institute, 2019

Slide 7.21



California Specialized Training Institute, 2019

Chapter 7



Supporting Materials/ Resource List

Safety Messages, Safety Briefings, and Special reports

The job of the Assistant Safety Officer-Hazardous Materials (ASO-HazMat) consists of equal parts observation and communication. In this chapter, we will discuss how the ASO-HazMat uses safety messages, safety briefings, and special reports to communicate both observations and concerns about incident operations to all on-scene personnel. Learning to develop these important tools will go a long way toward increasing your awareness of personnel safety and to reducing injuries.

Safety Messages

The purpose of the safety message is to list observed or projected hazards and risks. That is, safety message should address the hazards and risks that have loss potential or indicate trends toward potential accidents. Examples of potential hazards include long work hours and tired crews; slip, trip, and fall hazards; and rolling or falling debris.

Safety messages should be included in all Incident Action Plans (IAP). As a result, the ASO-HazMat will need to work closely with the Planning Section Chief to determine when these messages will be addressed in the IAP. *The ASO-HazMat should sign all safety messages.* Safety messages should be included in every plan that is handed out at the incident. In addition, they should be posted on all bulletin boards.

There is no absolute format for the safety message. For example, the safety message can be presented as an outline, in paragraph form, or as a chart. It all depends on the individual's style. Do what works for you. What's important is to ensure that the message is easy to follow and the language is clear and concise. Group information into logical areas, such as:

- Branch or division
- Functional area
- Risk/hazard categories

Safety messages should be written for each operational period. For the first operational period, the safety message may be based on information from the initial briefing. Safety messages should be updated for each operational period so that incident personnel receive timely, accurate safety information. As you update the safety message, vary the order of the message's elements to help keep responders' interest and to emphasize the message's key points.

The following diagram provides a framework for developing a complete safety message.

Diagram of a Complete Safety Message

Probability	**Damage**
Narrative	**Attitude**

Signature

California Specialized Training Institute, 2019

In the Probability quadrant, identify the likely risks (such as slip, trip, and fall). In the Damage quadrant, identify the extent of potential injuries and destruction to property. In the Narrative quadrant, identify the problem in clear, concise prose. In the Attitude quadrant, promote the safety attitude. (For example, remind responders to watch out for each other and to work in a buddy system.) Finally, the ASO-HazMat should sign the safety message.

This sample safety message combines both chart and paragraph form.

HazMat Group/Branch: General Safety Message

The same basic hazards are still facing all operation's personnel. Slip, trip, and fall hazards are still presenting a problem due to continuing decontamination operations. Don't forget that there may be new safety issues as fresh problems are encountered. I have noticed a definite decrease in production from entry crews this afternoon and would attribute this to fatigue. Don't let my continued harping on this subject get you down, because it is an ever-increasing reality each day of the incident.

Risks and Hazards to Look for	***Where***	***Probable Results/Damage (if not identified)***
Control line encroachment	Hazmat group	Minor/major personal injuries
Slip, trip, and fall	Decontamination	Minor/major personal injuries
PPE donning	Entry and decontamination	Potential exposures/contamination
Fatigue		Minor/major personal injuries

Our accident record on this incident to date is excellent. Only minor bruises, aches, blisters, etc., so far. Don't relax now when the worst seems to be over and only dirty, hard work remains.

Safety Officer_____(Signature)

California Specialized Training Institute, 2019

This sample safety message uses a simple numbered list to distill and convey important information.

Operational Period Safety Message

Seacliff Incident: Day Operational Period (07/31/91)

1. Use caution when moving vehicles due to foot traffic.
2. Tripping hazards throughout Incident Base
3. Air Ops. Need to communicate with Safety Re: flyovers. **No** flyovers during entry periods. (Entry Teams cannot communicate with noise above.)
4. No radio traffic on BRN. 1 (HazMat only).
5. All Supervisors observe condition of assigned personnel. Fatigue is now starting to become very apparent.
6. Only 2 injuries to date! Keep up the good work!!!
7. See HazMat Safety Plan!!

Safety Officer_____(Signature)

Safety Briefings

Safety briefings are verbal reports. They are used to clarify or emphasize the main points of the safety message. Safety briefings are also used to solicit and answer questions, and to note important changes that may have occurred since the original safety message was prepared. As the ASO-HazMat, it is critical that you ask questions. Asking questions can elicit important information about sources of problems that may have been missed. Safety briefings also are an excellent opportunity for you to develop a rapport with incident personnel and to establish the need for safety. Some incidents may require more than one briefing.

A good way to prepare for a safety briefing is to create an outline of items that will need to be covered. This way, you won't forget to include any important information. Consider highlighting aspects of the IAP that pose unusual or significant risk and identifying key hazards and risks.

The Incident Commander, Planning Section Chief, or overhead team should determine who (both number and type of personnel) attends the safety briefing. For example, in some incidents, the command group may receive the briefing before all line personnel. At hazardous materials incidents, all personnel should be briefed on the Site Safety Plan.

California Specialized Training Institute, 2019

Special reports

The ASO-HazMat may be called upon to complete or help complete a variety of special reports. Some reports are "form reports" that require filling out specific agency forms. Others are written as narratives in support of form reports or to document significant events.

Narrative Reports

It is wise to assume that you will have to write a narrative report of an incident. Narrative reports require a great deal of specific information. Keeping up with your ICS 214 Unit Log will help you keep track of these details. The narrative report should include:

- The number of injuries
- General safety situations and problems encountered
- A description of significant incidents or unsafe situations
- Recommendations for correcting the problems
- Copies of injury and accident reports

In the sample narrative report that follows, note the categories of information (summary, casualty patterns, response methods, etc.) and the kinds of details (location, time, etc.) that are included.

Aum Shinrikyo Subway Attack in Tokyo

Summary

At about 0800 on March 20, 1995, unknown persons placed packages on five trains in the vast Tokyo subway system. The individuals punctured the packages just before leaving the train, allowing sarin vapors to escape. All of the trains converged on a busy station in the center of Tokyo. The five packages affected more than 5,000 people, killing 12 and critically injuring 17 others.

Pattern of Casualties

Location: The victims came from 15 stations and the areas near those stations. Most of the casualties were on the Hibya (Yellow) line. It is one of the oldest lines and has the smallest stations with the lowest capacity HVAC systems.

Time: The incident began at 0750. By 0830, victims began to arrive at nearby hospitals. Within 10 minutes, hundreds of potential victims had arrived at 278 medical facilities in the center of Tokyo. Over the next few days, over 5,000 people had presented at hospitals or outpatient clinics; 641 of them at one hospital alone. (Authorities estimate 80 percent had suffered no chemical exposure or showed no symptoms.)

Symptoms: Most of the fatalities occurred immediately upon exposure. Several had sat next to the packages containing the sarin and some had handled the packages. In one case, a subway employee responding to passenger complaints, picked up one of the packages and carried it off the train. In

California Specialized Training Institute, 2019

another case, a janitor attempted to mop up the spilled liquid. Both were dead within a few minutes of exposure.

Survivors generally exhibited the following symptoms: headache, eye pain, blurred vision, myosis, constriction of the visual field, fatigue, respiratory distress, agitation, frustration, vomiting, and arrhythmia. Many others had convulsions, some severe.

Some survivors reported a strange odor in the train cars, but many, including several near the containers, did not. Several people noticed a sticky-looking gelatinous or watery substance near the packages.

Response and Treatment

First Response: Subway employees and local police officers were the first on scene. The only protective equipment they had were cloth gloves and gauze masks. Firefighters quickly responded with hazardous materials teams.

EMS Response: Fire and EMS responders were on scene quickly, but since the incident occurred on a busy subway on a weekday morning, most of the people exposed were awake and in reasonably good physical condition. Individuals who were exposed quickly left the train cars and made their way to local hospitals, either on foot or in taxis.

Identification: For about two hours after the release, doctors were told the substance involved was acetonitrile. Later analysis of the liquid from the packages showed high concentrations of acetonitrile from the manufacturing process used to produce the sarin. Within an hour, it became clear that the extent and type of symptoms didn't correlate with exposure to acetonitrile. After researching appropriate reference material, doctors determined the substance involved was a nerve agent, most likely sarin. Subsequent testing of the material confirmed this.

Method and Amount of Release

Method: The perpetrators placed sarin in five polyethylene bags, then put the bags in individual cardboard boxes. They wrapped the boxes with newspaper. They carried the packages onto five different trains in the Tokyo subway system. At a pre-arranged time, they punctured the packages with a sharp object and left the train. There was no provision for mechanical dispersion or heating. The liquid simply leaked out of the bag.

Amount: The exact amount is unknown. Authorities estimate there were less than 24 liters. Concentration: 25 percent.

Safety Officer_____(Signature)

California Specialized Training Institute, 2019

Environmental Monitoring



Scope

This chapter discusses the role of the Assistant Safety Officer-Hazardous Materials in on-scene environmental monitoring, emphasizing hazardous atmospheres, and addresses characteristics and limitations of air monitoring devices.



Terminal Learning Objective (TLO)

At the end of instruction for Chapter 8, participants will be able to assess on-scene environmental monitoring in order to protect responder and instrument safety.



Enabling Learning Objectives (ELOs)

This chapter's enabling learning objectives are to ensure participants will be able to:

1. Describe the basic approach an Assistant Safety Officer-Hazardous Materials (ASO-HazMat) should take to ensure the on-scene environment is properly monitored.
2. Define hazardous atmospheres.
3. Explain the limitations of field instruments and detecting devices.

Supporting Materials/resource List

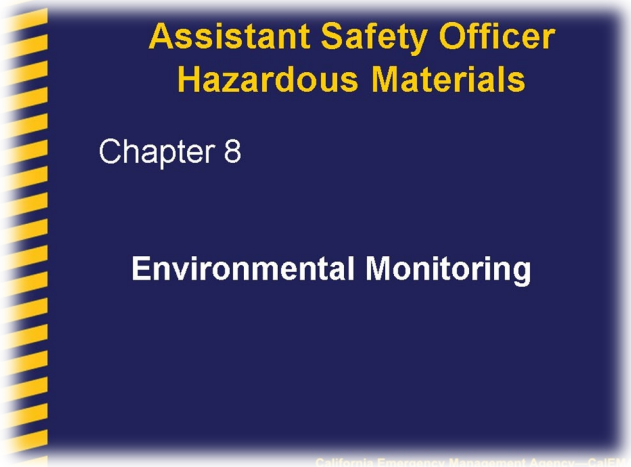
See Supporting Materials/Resource List section starting on page 341.



Practical Exercises

See Practical Exercises section starting on page 363.

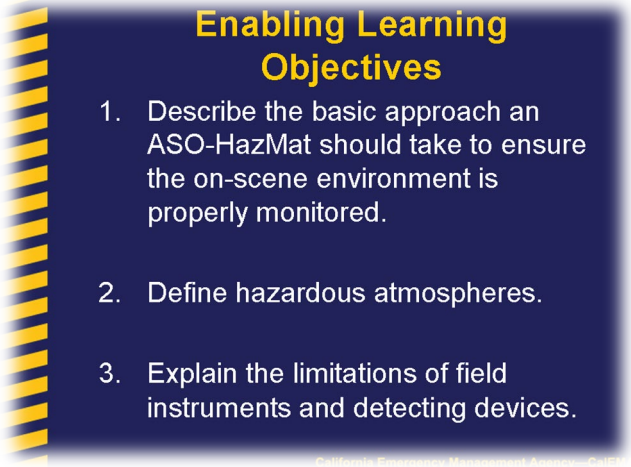
California Specialized Training Institute, 2019



Slide 8.1

The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

- (Res.B.2 3.2.1) Coordinate and direct hazardous materials detection and assessment activities.
- (Res.B.2 5.1.1.4) Conduct contamination surveys.
- (Res.B.2 5.1.2) Characterize consequences and risks.

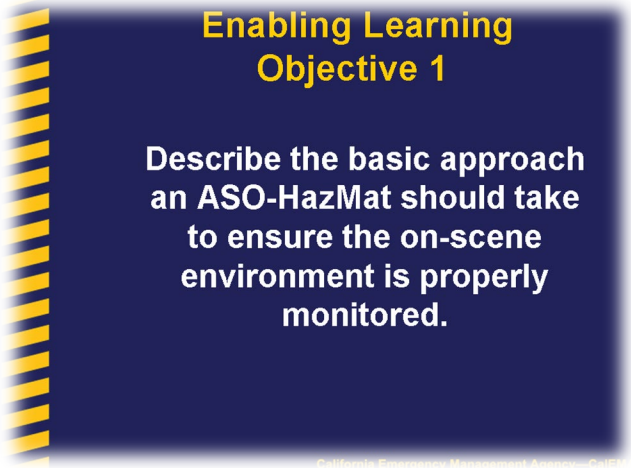


Slide 8.2

The goal (terminal learning objective) of this chapter is to ensure that participants will be able to assess on-scene environmental monitoring in order to protect responder and instrument safety.

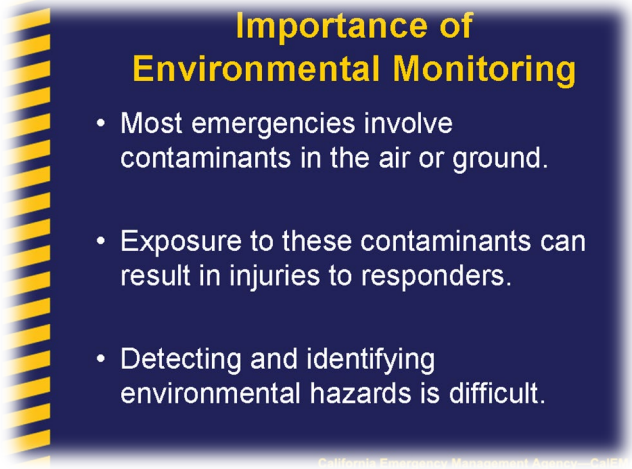
This chapter's enabling learning objectives are to ensure participants will have the capability to:

1. Describe the basic approach an Assistant Safety Officer-Hazardous Materials (ASO-HazMat) should take to ensure the on-scene environment is properly monitored.
2. Define hazardous atmospheres.
3. Explain the limitations of field instruments and detecting devices.



Slide 8.3

California Specialized Training Institute, 2019

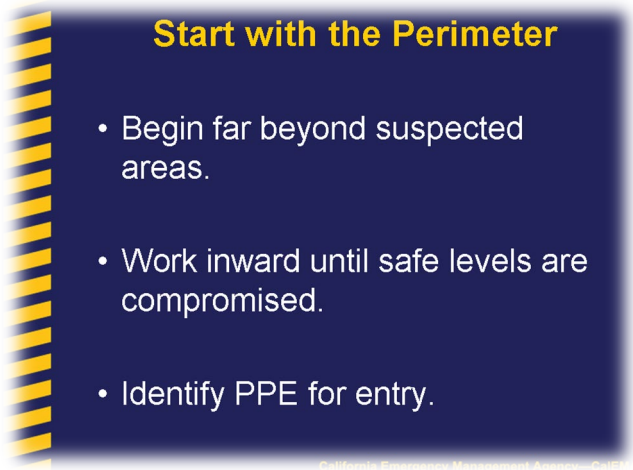


Slide 8.4

Environmental monitoring is perhaps the greatest and most common problem faced by hazardous materials responders. Most emergencies involve air- or ground-borne contaminants. Exposure to these contaminants can result in injuries to responders.

ASO-HazMats are tasked with preventing the exposure of incident responders to these contaminants.

Identifying the presence of environmental hazards can be difficult. When a solid or liquid is present, the evidence is usually visible. This is usually not the case with gases, vapors, and some mists. Detecting these invisible hazards, acquiring samples of the visible materials for testing, and determining the degree of danger requires the use of specialized equipment, instruments, and techniques. It is the ASO-HazMat's job to ensure that the identification of these substances is performed in the safest manner possible.



Slide 8.5

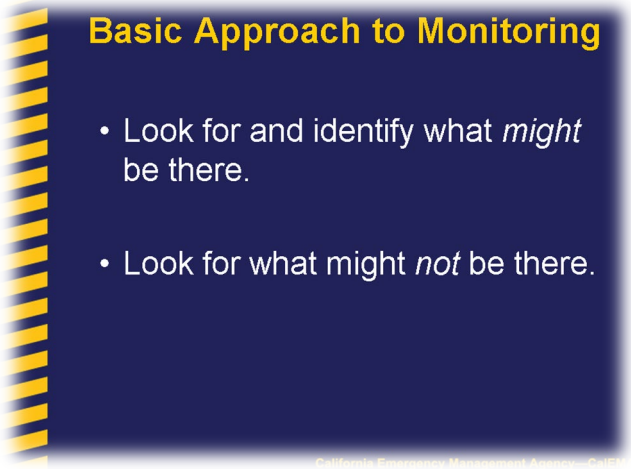
Whether the contaminant is in the air, in water, or the soil, a plan needs to be developed that will determine the location, spread, and quantity of the hazardous substance.

The largest and most rapidly spreading areas to monitor are those that are downwind, downstream, or downgrade from the spill site.

Logic dictates that responders begin the monitoring process far beyond the suspected areas and work inward until safe levels become compromised.

By this process, the areas requiring personal protective equipment for entry can be identified. However, monitoring stations should remain beyond the identified areas to detect the arrival or spread of contaminants.

California Specialized Training Institute, 2019

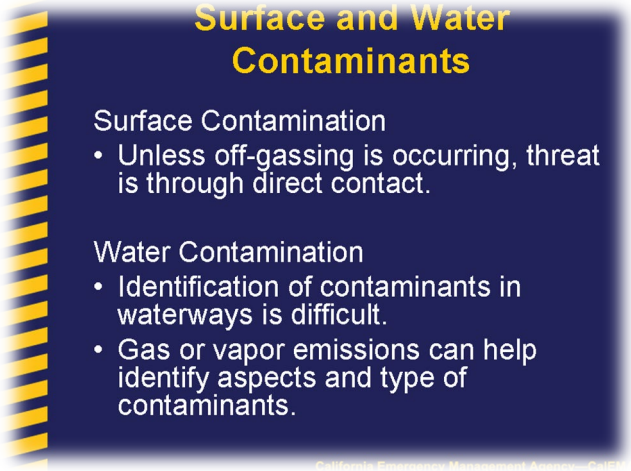


Slide 8.6

Analyzing an atmosphere in which the potential presence and type of hazardous material are unknown, an "unknown atmosphere," involves determining what is present at levels that pose a risk to health and/or safety.

Regardless of what—or where—contaminants may be, monitoring requires looking for and identifying what *might* be there, such as the presence of an explosive or toxic gas.

Monitoring also requires looking for what might *not* be there, for example, a lower than normal level of oxygen, which indicates the presence of other gases and, depending on the level of depletion, may be an asphyxiating atmosphere.



Slide 8.7

The typical hazardous materials technician/specialist is not trained or well-versed in the processes involved in soil and water sampling and testing.

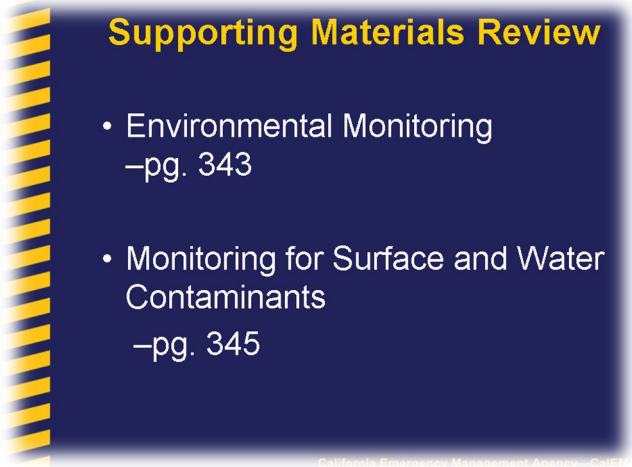
Even so, the ASO-HazMat should have a generalized understanding of these hazards.

Unless surface contaminants are off-gassing, they represent a threat to the environment or to the responder only through direct contact (non-inhalation exposure routes).

Local variations in water quality can vary greatly. This can make the identification of contaminant levels in rivers, lakes, and wellheads very difficult.

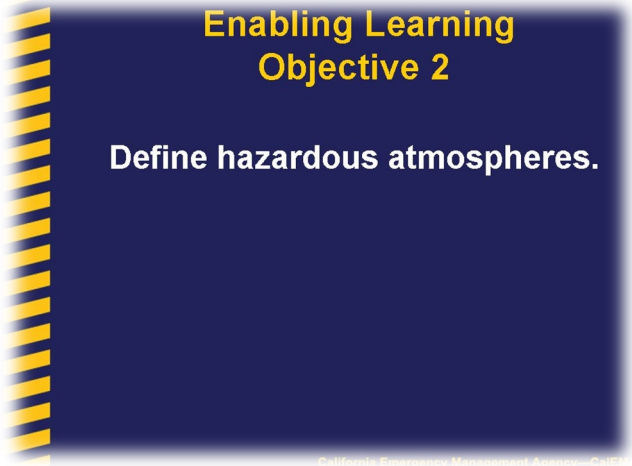
However, monitoring for the emission of gases and vapors from these locations can assist the responder in determining the aspect and type of water contaminants.

California Specialized Training Institute, 2019

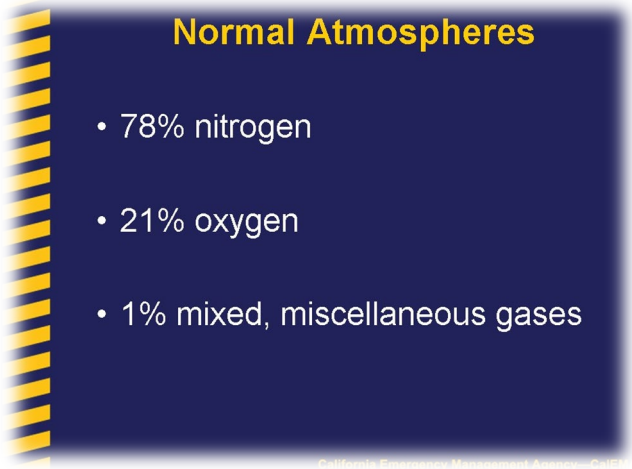


Slide 8.8

Review the listed supporting materials in the participant guide, pages 343 and 345.



Slide 8.9



Slide 8.10

Proper monitoring of hazardous atmospheres not only includes looking for gases which are there, but also monitoring for gases which are *not* there.

Knowing the composition of normal atmospheres will help you to define what shouldn't be there.

Normal air is composed of approximately:

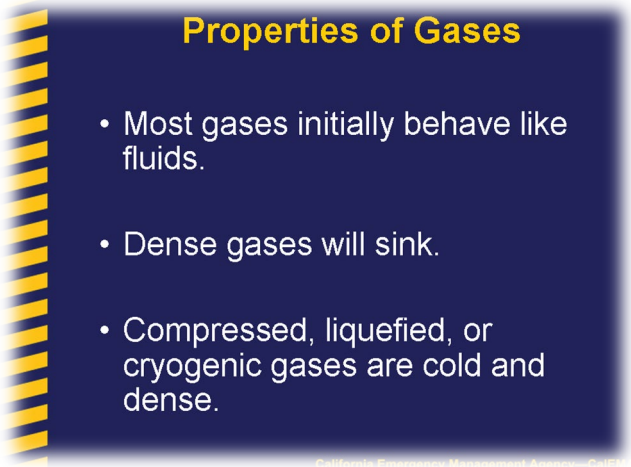
- 78 percent nitrogen
- 21 percent oxygen
- 1 percent mixed, miscellaneous gases, including carbon dioxide



Slide 8.11

In terms of contaminants:

- Lower explosive limits of flammable gas must be present for explosive combustion to occur. This may be as low as 1% of the atmosphere (10,000 ppm)
- Some very toxic substances need to be present in just a few parts per million in the air to cause harm.
- Large doses of radiation (several hundred rems), may cause serious injury if received in a short time period (minutes, hours, or days). Exposure to large doses of radiation increases the risk of cancer.
- Oxidizing and corrosive gasses also present a threat to the emergency responders and displace or consume oxygen.



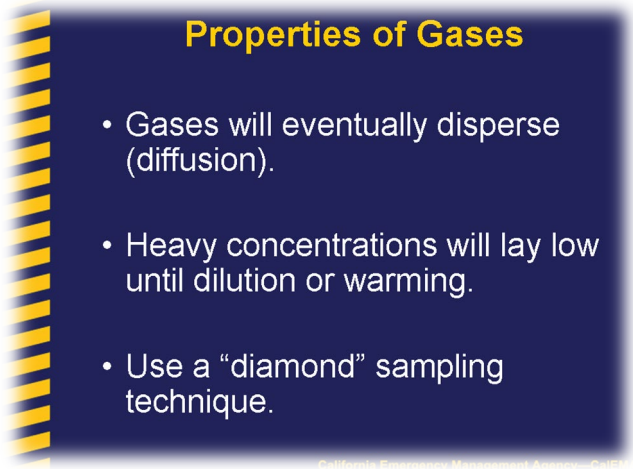
Slide 8.12

When released from their containers, gases tend to settle into a space much like liquids do.

There are two reasons for this. First, if the gas has a vapor density greater than the density of a normal atmosphere (greater than one), it will initially sink, rather than dissipate.

Second, any gas released from a compressed, liquefied, or cryogenic state is cold and dense. It will behave like a heavier-than-air gas, even if its vapor density is lighter than air (less than one), until the gas nears ambient temperatures.

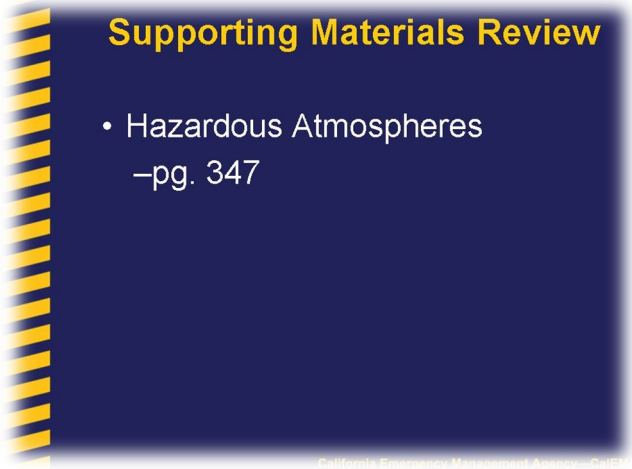
California Specialized Training Institute, 2019



Slide 8.13

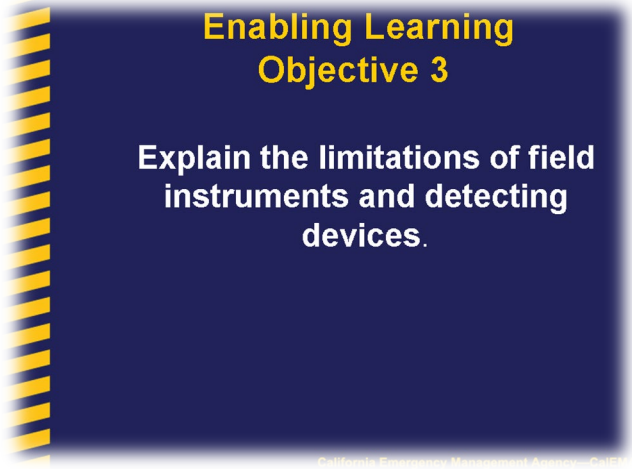
Unlike fluids, all gases will eventually disperse. This process, called diffusion, causes the gas to fill the entire space that it occupies, particularly as the concentration of the gas dilutes to about 1% (10,000 ppm) in air.

A reasonably representative sample of the atmosphere can be obtained by using some logical sampling scheme or technique that covers the corners of the compass, such as in an imaginary diamond shape.

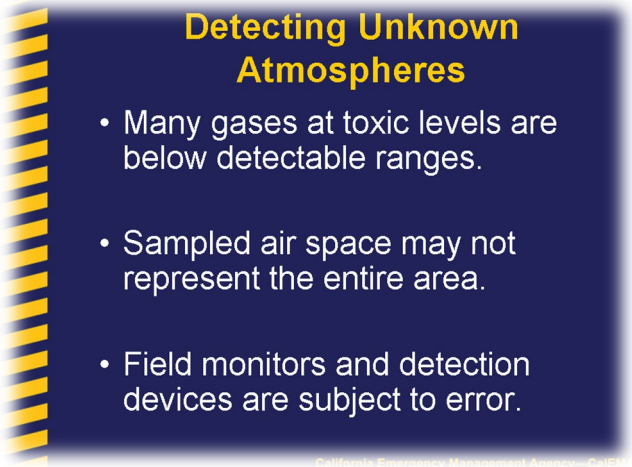


Slide 8.14

Review the listed supporting materials in the participant guide, page 347.



Slide 8.15



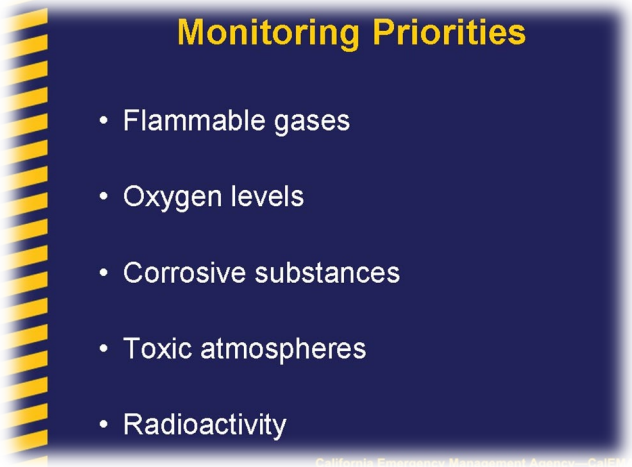
Slide 8.16

To protect the health and safety of hazardous materials responders who are detecting contaminated atmospheres, the ASO-HazMat should keep the following points in mind.

- Many toxic gases are dangerous at concentrations that may not be detectable by most field instruments.
- The small amount of air sampled may not be representative of the entire area. Do not make broad assumptions about the safety of a large volume of air based solely on the field analysis of a few small samples.
- Field instrument readings are subject to errors due to improper operation, calibration, calibrant gas used, sensor poisoning, atmospheric conditions, exceeded service intervals, and other reasons.

The best, most reasonable assurance that an unknown atmosphere is safe to occupy and breathe can be obtained only after a careful and thorough investigation. This analysis must include both a careful examination of the atmosphere, using a variety of detection devices, and an examination of the situation and potential sources of contamination.

Field instrument limitations will be discussed in more detail later in this presentation.



Slide 8.17

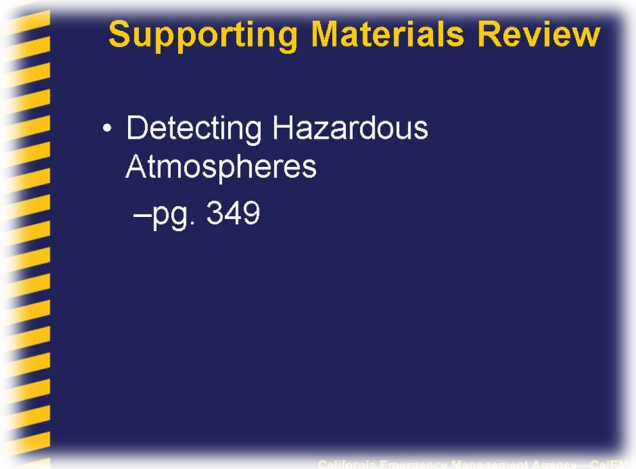
Safe and efficient monitoring requires a logical and systematic approach, especially at an incident where the hazardous substance is unknown.

HazMat response teams should monitor for some substances before—or while simultaneously—monitoring for others.

HazMat response teams should monitor for the presence of toxic atmospheres, flammable gases, oxygen levels, corrosive substances, and radioactive hazards.

Keep in mind that every incident is different. Specific information about an incident would dictate a different approach to response than is typically used. The priority used in monitoring must be based on safeguarding both responders and instruments. (Compromised devices pose a risk to HazMat responders, who rely on proper instrument function.)

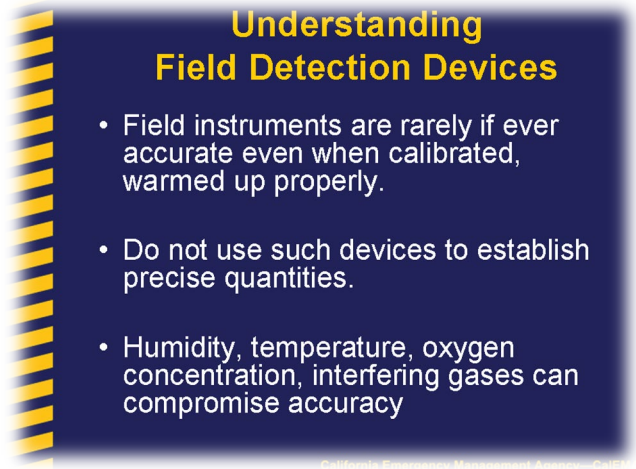
California Specialized Training Institute, 2019



Slide 8.18

Review the listed supporting materials in the participant guide, page 349.

This section goes into more detail about monitoring priorities.



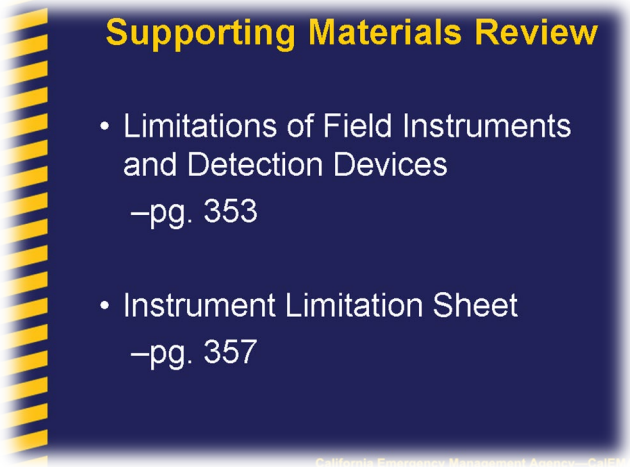
Slide 8.19

Point out that field instruments are rarely—if ever—accurate. Many conditions can compromise the accuracy and functioning of field instruments that pump exterior atmosphere into a chamber for analysis. Among these conditions are humidity, temperature, oxygen concentration, interfering gases/cross sensitivities, and incorrectly set audible warning levels.

Also highlight the fact that monitoring instruments must be properly calibrated, warmed up, operated, observed, converted, interpreted, and serviced. It is extremely important for HazMat responders to view monitoring instruments as tools to *qualify* the environment.

In other words, a HazMat responder should not use field detection devices to establish precise quantities. Instead, responders should interpret any movement on the face of the monitor or detector as an indication that a hazardous substance exists in sufficient quantity to burn, to be toxic, to corrode, and/or to asphyxiate.

Moreover, responders must determine instrument operational ranges by reading manufacturer's information or by developing instrument limitation sheets for each monitoring device every time they use them.

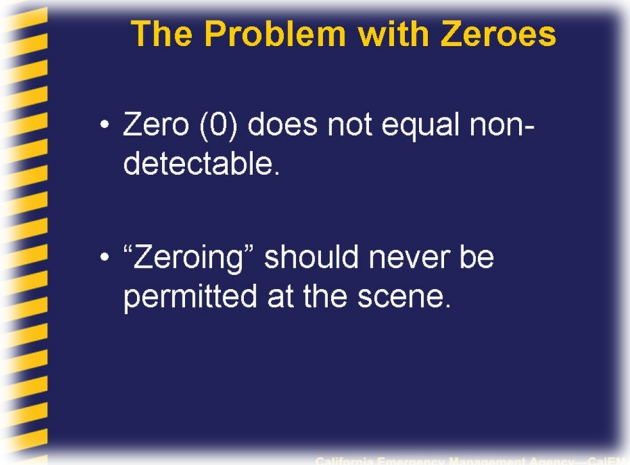


Slide 8.20

Review the listed supporting materials in the participant guide, pages 353 and 357.

Every monitoring instrument has limitations. Some of these limitations are due to human error (such as calibration, interpretation, and operation), while others are limitations of the instrument itself (such as environmental conditions, sensor poisoning, and exceeded service intervals).

Trying to remember each device's limitations can be exhausting. One way to keep track of "use by" dates and other limitations is to develop and use instrument limitation sheets. These documents provide a quick review of the instrument's operational limits and deviation or interpretation tables.



Slide 8.21

It is unfortunate that "0" appears on meters. Instead of the number "0," the words "non-detectable" or ND should appear. While most people understand that non-detectable is not zero, the number "0" on the meter can often override logic.

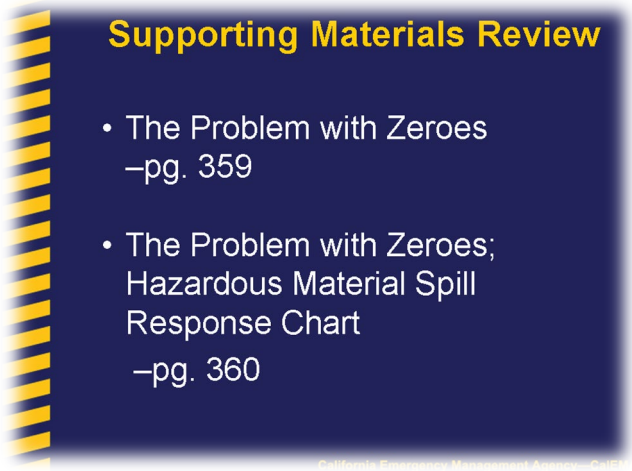
Many monitoring instruments permit the user to "zero" or "fresh air calibrate" the device. This should never be permitted at the scene for two reasons.

First, small amounts of contaminants from the environment can enter the detection chamber before the instrument's sensitivity can register it. Zeroing out the meter removes this initial ppm exposure and provides a false (lower) reading for the total exposure.

Second, zeroing the meter removes the background readings. Zeroed meters start at "0." This means there is nowhere to go if an interfering, saturating, or humid environment is encountered later. A background reading is a positive indication. When an atmosphere enters the chamber that the machine cannot process, the meter reading will deflect toward zero.

If responders still feel that they must "zero the meter," then this function should be performed back at the station and away from running vehicles or other potential contaminants. Keep in mind, even pollen and perfume are measurable contaminants.

California Specialized Training Institute, 2019

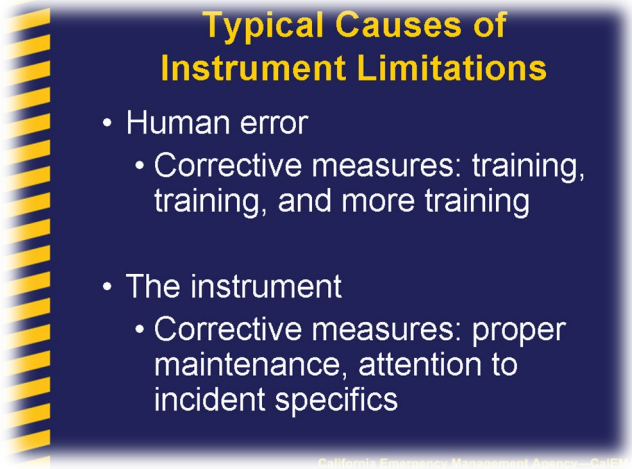


Slide 8.22

Review the listed supporting materials in the participant guide, pages 359 and 360.

In particular, take time to carefully review the Hazardous Material Spill Response Chart on page 360. Most calibration errors occur from incorrect potentiometer settings or inappropriate gas usage (type, quantity, or contaminations).

Most interpretation errors occur because responders calibrate their instruments to one gas for setting the instrument parameters and then forget to use the standard deviation tables provided by the manufacturer when monitoring for unknown or other gas environments.



Slide 8.23

Extensive and repetitive training is the best way to reduce human error (such as inaccurate calibration, interpretation, and operation). Unfortunately, this type of activity can be tedious.

As a result, it is extremely important for the Safety Officer and ASO-HazMat to help motivate personnel in these tasks.

Limitations of the instrument itself (such as sensitivity to environmental conditions, sensor poisoning, and exceeded service intervals) are best eliminated by proper maintenance and attention to incident specifics.

California Specialized Training Institute, 2019



Slide 8.24

Each instrument or device has its own strengths, limitations, and “blind” spots. No single instrument can provide all the information to determine the safety of an unknown atmosphere. More complete and accurate information about the atmosphere being tested can be obtained by using several instruments and comparing the results.

If an instrument doesn’t respond to an atmosphere, that, in itself, provides information that can be useful.

On a combustible gas indicator, a lack of response to a lower explosive limit, for example, doesn’t mean that the atmosphere is devoid of contaminants, only that the level of the contaminant is too low or of a type the instrument cannot detect.

Non-response readings shouldn’t be ignored. Instead, they provide another piece of information about what is, or isn’t, in the atmosphere. *Any* information is valuable information.



Slide 8.25

The subject of monitoring devices is a complex one. Once a jurisdiction has selected a line of detection devices, responders should receive all the training necessary to ensure that they are able to properly use those particular instruments and to make safe decisions based on the readings obtained.

Not only must the ASO-HazMat have the knowledge and ability to perform monitoring tasks effectively, the ASO-HazMat must also be able to assess whether responders in the field are using the various devices appropriately and safely.

California Specialized Training Institute, 2019

Chapter 8



Supporting Materials/ Resource List

Environmental Monitoring

Most emergencies involve contaminants in the environment, whether in the air, in water, or in the soil. Monitoring for environmental contaminants and protecting responders may is a common problems that hazardous materials responders face. Ensuring the prevention of such exposures to incident responders is the responsibility of the Assistant Safety Officer-Hazardous Materials (ASO-HazMat).

One of the greatest difficulties in preventing injuries from exposure to environmental contaminants is in knowing if such hazardous substances are even present. When a solid or liquid is present, the evidence is usually visible. However, this is not typically the case with gases, vapors, and some mists. Detecting and identifying these invisible hazards requires the use of specialized equipment, instruments, and techniques. It is the ASO-HazMat's job to ensure that the identification of these substances is performed in the safest manner possible.

It should be obvious by now that the subject of monitoring devices is a complex one. Once detection devices have been chosen for a particular jurisdiction, personnel should receive all the training necessary to ensure that the instruments are not only used properly, but that the user is able to make conclusions based on the readings obtained. For the Safety Officer, confirmation of, and, confidence in the abilities of incident responders to perform these tasks appropriately can be an unsettling experience. This is ample justification for the Safety Officer to be able to adequately assess the use of monitoring instruments in their own right. Individuals assigned as the Assistant Safety Officer-Hazardous Materials must have the knowledge and ability to assess the operations being performed by responding personnel in order to perform their tasks effectively, especially monitoring operations.

Perimeter Monitoring

Whether the contaminant is in the air, in water, or soil, a plan needs to be developed that will determine the location, spread, and quantity of the hazardous substance. The largest and most rapidly spreading areas to monitor are those that are downwind, downstream, or downgrade from the spill site. Logic dictates that responders begin the monitoring process far beyond the suspected areas and work inward until safe levels become compromised. By this process, the areas requiring personal protective equipment for entry can be identified. However, monitoring stations should remain beyond the identified areas to detect the arrival or spread of contaminants.

California Specialized Training Institute, 2019

Monitoring for Surface and Water Contaminants

Monitoring for surface and water contaminants is not usually a primary concern for an ASO/HM and is not the focus of this chapter. The typical hazardous materials technician/specialist is not trained or well-versed in the processes involved in soil and water sampling and testing. These functions as usually left to an industrial hygienist or environmental health officer. Local hydrologists or health officials should be consulted to help determine abnormal levels of water impurities. However, the ASO-HazMat should have a generalized understanding of these hazards and when they could impact responders.

Surface Contamination

Differentiating between clean and dirty surfaces is usually much easier than determining the presence of invisible gases and vapors. Monitoring for unknown surface contaminants requires looking for and recognizing what might be there. This involves using various tools, such as augers, and techniques to sample and test for contaminants. Monitoring for unknown surface contaminants also involves looking for what is not there. The ASO should ensure that responders use sampling tools and equipment using methods that prevent or limit exposure.

Groundwater Contamination

Groundwater contamination is not usually a concern of the ASO/HM at an emergency scene. Only modern processed water is totally pure and pH neutral. "Normal" water is infused with metals, salts, nitrates, and other impurities. Local variations in water quality can vary greatly. This can make the identification of contaminant levels in rivers, lakes, and wellheads very difficult. Retrieving measurable quantities of unknown contaminants from these bodies of water may involve complex separation dams, water skimmers, or other sophisticated techniques and methodologies.

Differentiating between clean and contaminated water is usually much more arduous than determining the presence or absence of gases and vapors. However, monitoring for the emission of gases and vapors from these locations can assist the responder in determining the aspect and type of water contaminants. Responders can also employ common solid and liquid testing processes or engage professional diagnostic laboratories to identify the contaminants.

California Specialized Training Institute, 2019

Hazardous Atmospheres

Hazardous atmospheres present one of the greatest problems for monitoring at the emergency scene. The first step in identifying abnormal atmospheres is to understand the normal composition of air. A number of gases comprise a normal atmosphere. The presence of these gases is necessary to sustain life. Most of these components are nontoxic at typical concentration levels. (Normal air is composed of approximately 78 percent nitrogen; 21 percent oxygen; and 1 percent mixed, miscellaneous gases, including carbon dioxide.) Some are quite toxic at higher concentrations (such as carbon monoxide and nitrogen dioxide). However, any significant deviation from normal concentrations in these gases can be hazardous.

unknown Atmospheres

Analyzing atmospheres in which the potential presence and type of hazardous material are unknown, an "unknown atmosphere," involves determining what is present at levels that pose a risk to health and/or safety. Monitoring for unknown atmospheres also involves looking for what is not there. Atmospheres can become hazardous because of: contaminants, displaced gases or consumed gases. Each of these can create multiple mitigation problems and can adversely affect responders.

In terms of contaminants, lower explosive limits (LEL) amounts of flammable gas must be present for an explosion to occur. This limit can be reached in some cases at 1% of the atmosphere. Much smaller amounts of toxic contaminants need to be present to cause harm, in some cases as low as 10 parts per million. Another possible contaminant, miniscule radioactive gases and aerosolized radioactive materials create radioactive atmospheres. Large doses of radiation (several hundred rems) may cause serious injury if received in a short time period (minutes or hours). Moreover, large doses of radiation increase the risk of cancer.

Large amounts of contaminants have the effect of measurably displacing air, the Occupational Safety and Health Administration (OSHA) has set legal atmospheric testing requirements that must be performed before personnel are allowed to enter unknown atmospheres and confined spaces (29 CFR 1910.120 and 146 CFR). In addition to analyzing for gases that are present, proper monitoring of hazardous atmospheres includes checking for gases that are *not* present. Knowing the composition of the normal atmosphere will help you to define what should and should not be there.

Finding the Gas

California Specialized Training Institute, 2019

Most gases behave like fluids, at least initially. When released from their containers, they tend to settle into a space much like a liquid does. There are two reasons for this: If the gas has a vapor density greater than the density of a normal atmosphere (greater than one), it will initially sink, rather than dissipate. In addition, any gas released from a compressed, liquefied, or cryogenic state is cold and dense. It will behave like a heavier-than-air gas, even if its vapor density is lighter than air (less than one), until the gas nears ambient temperatures.

Unlike fluids, all gases will eventually disperse. This process, called diffusion, causes the gas to fill the entire space that it occupies. Convective heating and forced ventilation can also accelerate diffusion and mixing with the atmosphere. Diffusion of gases occurs despite the vapor density of the gas. (Even gases

with a vapor density greater than one will eventually diffuse.) Diffusion results in a relatively uniform distribution of the gas throughout the space.

California Specialized Training Institute, 2019

detecting Hazardous Atmospheres

When investigating unknown atmospheres and predicting the location of the gas, the responder must consider the overall situation. For example, if the suspected source of the contaminant is continuing to release gas, it's reasonable to expect the gas to behave as most gases do initially. (That is, heavy concentrations will lay low until the gas dilutes or warms up.) The bulk of the gas will behave this way throughout the duration of the release. On the other hand, if the release of gas has stopped, and some time has elapsed, the gas should be expected to diffuse and occupy the entire space in somewhat similar concentrations.

To protect the health and safety of hazardous materials responders who are detecting contaminated atmospheres, the Assistant Safety Officer-Hazardous Materials (ASO-HazMat) should keep the following points in mind:

- Many toxic gases are dangerous at concentrations that may not be detectable by most field instruments.
- The small amount of air sampled may not be representative of the entire area. Do not make broad assumptions about the safety of a large volume of air based solely on the field analysis of a few small samples.
- Field instrument readings are subject to errors due to improper operation, calibration, calibrant gas used, sensor poisoning, atmospheric conditions, exceeded service intervals, and other reasons.

The best, most reasonable assurance that an unknown atmosphere is safe to occupy and breathe can be obtained only after a careful and thorough investigation. This analysis must include both a careful examination of the atmosphere, using a variety of detection devices, and an examination of the situation and potential sources of contamination.

Negative findings during an atmospheric survey should be treated with skepticism when the release of a gas is known to have occurred or could reasonably have occurred, such as in an industrial manufacturing plant or storage area. Reliance on the results of field detection equipment alone is risky business, and further investigation is warranted. On the other hand, negative readings can probably be safely interpreted as accurate when they have been taken from a residential area where a release cannot be verified or when any reasonable source of a hazardous atmosphere cannot be found. Responders have to apply their knowledge of hazardous materials, plus good common sense, to develop an accurate picture. A reasonably representative sample of the atmosphere can be obtained by using some logical sampling scheme or technique that covers the corners of the compass, such as in an imaginary diamond shape.

California Specialized Training Institute, 2019

Monitoring Priorities

Monitoring has two primary objectives. The first objective is to protect responders by identifying contaminants in the environment. Atmospheric monitoring protects responders by identifying the dangerous conditions in an unknown atmosphere. Atmospheric monitoring also protects responders by detecting and/or measuring the concentrations of a particular substance in an atmosphere that is known to be contaminated.

The second primary objective of monitoring instruments is to protect the "follow-on" meters long enough so the first objective can be accomplished. To accomplish the second objective, especially at an incident where the hazardous substance is unknown, safe and efficient monitoring requires a logical and systematic approach. Hazmat response teams should monitor for some substances before—or simultaneously—monitoring for others.

Keep in mind that every incident is different. Specific information about an incident may dictate a different approach to response than is typically used.

Monitoring an "Unknown Atmosphere" requires a logical sequence of testing. The priority used must be based on safeguarding both responders and instruments. No specific order is required for monitoring a hazardous materials incident. The ASO-HazMat must evaluate the monitoring plan developed for the incident. The hazards of each incident should be identified and priorities adjusted accordingly.

Note: The following subheadings to not indicate an order for monitoring but are presented for discussion. The priority and order will be developed at the incident scene based on information gathered and a logical testing sequence.

Combustibility/Flammability

Checking an unknown atmosphere for the presence of flammable gases or vapors should be done as soon as possible. As mentioned earlier, checking for flammable gases or vapor may need to occur simultaneously with other tests. It is best to use a combustible gas indicator (CGI) for checking for flammable gases or vapor. The CGI is designed to measure for flammable gases or vapors in relationship to their lower explosive limits (LEL). CGIs can measure concentrations in parts per million.

Each agency should develop its own standard operating procedures regarding monitoring atmospheres known to contain flammable vapors. The Occupational Safety and Health Administration (OSHA) criteria for personnel entering confined spaces limit concentrations to no higher than 10 percent of LEL (29CFR 1910.134 and 29CFR 1910.146). The National Institute for Occupational Safety and Health publication (NIOSH), *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (No. 85-115), suggests immediate withdrawal from an area where concentrations exceed 25 percent of LEL.

However, these guidelines are based on worker safety in non-emergency situations. They are intended to provide a wide margin of safety against inaccurate instrument readings, operator errors, and other unforeseen conditions. Emergency responders have some flexibility to exceed these concentrations, but must do so only with careful consideration to all risks and options. Keep in mind that these criteria consider flammability only. Do not assume that atmospheres below a 10 or 25 percent LEL are safe to enter.

Since the OSHA and NIOSH guidelines do not address toxicity, responders must proceed with extreme caution if any readings are obtained. For example, ethylene oxide has an LEL of 4 percent or 40,000 ppm, but is considered immediately dangerous to life or health (IDLH) at only 800 ppm. Criteria by OSHA, NIOSH, the United States Coast Guard (USCG), and the Environmental Protection Agency (EPA) for entering confined spaces ignore the fact that, although the atmosphere may be safe in terms of flammability, safety levels for toxicity have already been exceeded (10 percent of LEL = 4,000 ppm and 25 percent

California Specialized Training Institute, 2019

of the LEL is 10,000 ppm). In fact, any deflection of any meter, however slight, should be regarded as an indication that something may be present in potentially lethal concentrations.

Responders must also keep in mind that, for a CGI to function properly, the supply of oxygen in the atmosphere must be an adequate. Some CGIs will not give reliable results when oxygen concentrations fall below 16 percent. Others are designed to operate in oxygen levels as low as 8 percent.

Oxygen Levels

Oxygen levels should be ascertained after the atmosphere has been monitored for flammable limits. Oxygen survey meters provide information on oxygen levels relative to normal atmospheric concentrations (20.9 percent). The federal definition for oxygen deficiency—an asphyxiating atmosphere—is an atmosphere containing less than 19.5 percent oxygen. The OSHA standard for oxygen levels (minimum of 19.5 percent, maximum of 23.5 percent) considers only the effect of oxygen itself and not the presence of other materials.

Any deflection on an oxygen meter, however slight, indicates an abnormal condition and the presence of something else in significant concentrations. As the contaminant level increases, the oxygen level decreases. The exact percentages may vary slightly, depending on the particular contaminant and how it reacts with the oxygen or other gases in the air.

The relationship between oxygen levels and contaminants is an important concept. If you are monitoring an unknown atmosphere and see any deflection of the needle when measuring oxygen concentration, it's an indication that some other material(s) is/are present. The potential concentration of these contaminants is equal to 5,000 ppm for each 1 percent of oxygen displacement. A 1.4 percent drop in the oxygen level (which is still not considered oxygen deficient by OSHA standards) means there could be a contaminant concentration as high as 7.0 percent or 70,000 ppm—*well above* the toxic concentration levels of most gases.

Corrosive Substances

Corrosive vapors also have been known to destroy sensitive electronic devices. A quick test for the presence of a corrosive atmosphere is to attach a damp (wetted) piece of pH or litmus paper to a long stick. (The paper must be wet so the corrosive vapor can ionize on the paper and prove itself acidic or basic.) Hold the pH or litmus paper out far enough ahead of the other meters and detectors to ensure that they won't be ruined by corrosive vapors.

Keep in mind that testing for corrosive vapors should be done ***in conjunction with*** other monitoring procedures to ensure responders do not unwittingly approach a flammable or toxic atmosphere.

Toxic Atmospheres

Responders must check for toxic concentrations. These substances usually require far fewer ppm to cause serious hazards. For example, the NIOSH guide doesn't list toxic hazardous materials with an IDLH above 5,000 ppm. Most of the deadliest materials have ppm values below 500 ppm. Yet, the lowest LEL values don't even begin until well over 1,000 ppm.

California Specialized Training Institute, 2019

Several instruments are typically used for detecting the presence of toxic environments in low concentrations: photoionization detectors (PIDs), electrochemical sensors, and colorimetric tubes. The flame ionization detector (FID) can also be used for trace contaminants. Most current model CGIs are capable of detecting ppm levels as well. The PID and the FID are both very sensitive instruments and can detect very low levels of contamination. However, they are limited in the range of materials they can detect.

radioactivity

Although true radiological incidents are rare, a complete survey of the atmosphere necessitates looking for both ionizing and non-ionizing radiation. Though beta and gamma are relatively easy to detect, only a very careful, inch-by-inch survey is going to detect alpha emissions. Since gamma radiation can travel the farthest distance and is not wind dependant, it should be tested for first. If the test is negative, a careful survey for beta particles should be conducted second.

Most radiological monitors are not intrinsically safe. If there is reason to suspect a flammable atmosphere, responders must first check the area with a CGI or use a radiological meter, which is intrinsically safe.

California Specialized Training Institute, 2019

Limitations of Field Instruments and detection devices

When is a field instrument accurate? Probably never! At least, not when it comes to typical field use. Many conditions can compromise the accuracy and functioning of field instruments that pump exterior atmosphere into a chamber for analysis. These conditions include:

- Humidity
- Temperature
- Atmospheric pressure/altitude
- Oxygen concentration
- Sunlight
- High concentrations/saturation
- Electromagnetic interference
- Dust/particulates
- Interfering gases/cross sensitivities
- Response/lag time
- Sensor/tube expiration/poisoning
- Span settings/stroke count
- Air movement
- Incorrectly set audible warning levels

In addition, monitoring instruments must be properly:

- Calibrated
- Warmed-up
- Operated
- Observed
- Converted (using response curves/conversion tables)
- Interpreted
- Serviced

Field detection devices are inherently limited. It is best to use such devices only to *qualify* the environment. In other words, a hazmat responder should not use field detection devices to establish precise quantities. Instead, responders should interpret any movement on the face of the monitor or detector as an indication that a hazardous substance exists in sufficient quantity to burn, to be toxic, to corrode, and/or to asphyxiate. Using field detection devices to establish precise quantities is ill-advised. *Responders must determine instrument operational ranges by reading manufacturer's information or by developing instrument limitation sheets, such as the one on the following page, for each monitoring device every time they use them.*

California Specialized Training Institute, 2019

The information in the following charts is not readily available in product manuals. Through interviews with technical experts at the manufacturers, these charts were developed in 1996 by Daniel K. Law of Emergency Response Consultants for the California Specialized Training Institute.

Characteristics of Air Monitoring Devices

Device	Range	Sensor	Response Lag	Response Time	Accuracy	Temp.	RH	Battery
GT1314	0–25% 0-1000	Ele.Chem Catalytic	5 Sec.	20 Sec. to 90%	+/-5% +/-10% Scale	-4 to 100	0–90%	8–10 Hrs.
GT201	0–30% 0–10,000	Ele.Chem Catalytic	5 Sec.	20 Sec. to 90%	+/-5% +/-10% Scale	-4 to 113	0–95%	2–10 Hrs.
Eagle	0–40% 0–12,000	Ele. Chem	5 Sec.	30 Sec. to 90%	+/-5% Scale	14 to 104	0–95%	18–30 Hrs.
RAE	0–30% 0–2,000	Ele. Chem 3–Catalytic PID	3 Sec.	10–150 Sec. to 90% Scale	+/-10% Scale	-4 to 113	0–95%	10 Hrs.
HNU	0.1–2,000	PID	5 Sec.	5–30 Sec. to 90%	400–600 Linear +/-1%–20% Scale	25–104	0–90%	10 Hrs.

Characteristics of Air Monitoring Devices

Device	Alarms	Methane Elim. SW.	Calibrations	Calibrant Gases	Operation 02 Level	Special Notes
GT1314	Gas Trouble	Special Order	Before/After 1 Mos.	Methane, Pentane, Hexane	16%	Discontinued
GT201	Gas Trouble Comfort	Special Order	Before/After 1–3 Mos.	Methane, Hexane	To 10% Rich Reads Normal	None Noted
Eagle	Gas Trouble	Yes	Before/After Monthly	Methane, Hexane	8%	½ to 4 Hr. Accuracy delay, New batt./sensor
RAE	Gas Trouble	Default	Before Use	Methane, Isobutylene	16%	24 Hr. Accuracy delay w/new sensor
HNU	Special Order	Does Not Detect	Daily or Every Other Day	Benzene, Vinyl Chlor., Isobutylene, NH3, H2S, Ethylene OX.	N/A	None Noted

California Specialized Training Institute, 2019

Characteristics of Air Monitoring Devices

Device	Limitations	Problems	Interfering Gasses	Information
CGI	Low 0_2 High 0_2 High Humidity High Temps. High Altitudes	High concentrations Conversion tables Response curves EM interference	Organic metals Silicates, Sulfurs Freons, corrosives Oxy-acetylene Hot (cond.) gas	Confirm/eliminate flammable gasses
Electro-chemical	High Humidy High Temps. High Altitudes	Sensor poisoning	Acetylene Propane Methanol	Confirm/eliminate specific gas
Oxygen	Temps. below 32° High Humidity High Temps. High Altitudes	Response time subject to 0_2 concentration 1% +/- error range	Carbon dioxide	Confirm/eliminate asphyxiating gasses
Colorimetric	Sunlight High Humidity High Temps. High Altitudes Expiration Dates	Cross sensitivities Stroke # Quantity vs. quality	Dependent upon tube used	Confirm/eliminate specific/cross-sen. gasses w/in range
Photo-ionization	High Humidity Dust Diesel Exhaust Blind to: Methane, SO_2, H_2S and CO	IP vs.eV, EM inter. No resp./conv. tables Must be re-zeroed Span settings Doesn't reflect conc.	Water vapor Hot (cond.) gas' Non-ionizing gas' Hard/salt water	Confirm/eliminate toxic gasses
Flame-ionization	High Humidity Intrinsic Safety Read in Units	No resp./conv. tables Reflects total conc.	Water vapor Non-ionizing gas'	Confirm/eliminate organic gasses
Radiation	Device Range	CPM conversion TLD/dosimeter readings	Water vapor	Confirms/eliminate ionizing radiation w/in range and type

California Specialized Training Institute, 2019

Instrument Limitation Sheet

Instrument _____

Model Number _____

Measuring Range_____to_____%/ppm

Temperature Operating Range_____° to_____° Accuracy _____

Humidity Ceiling_____% Altitude Limitation _____

Oxygen Range_____to_____ UV Lamp eV _____

Sensor Type_____ Calibrant Gas _____

Lag Time_____ Response Time _____

Problems/Sensitivities _____

Interfering Gases _____

Device Limitations _____

Class _____ Group _____ Division _____

Methane Elimination Switch Y N Battery Life _____

California Specialized Training Institute, 2019

The Problem with Zeroes

The number zero appears on many meters used at hazardous materials incidents. Rather than the num- ber "0," the word "non-detectable" or the letters "ND" should appear. While most people understand that ND is not the number zero, the number zero on the meter can often provide a false sense of safety. Using the wrong instrument can result in a "0" at very high levels. For example, a PID should never be the instrument of choice when entering a confined space. PIDs are "blind" to some of the most common hazardous gases encountered in confined spaces, such as carbon monoxide and methane. While PIDs are extremely good at seeing very low levels of chlorinated solvents and aromatic hydrocarbons, they also have very low sensitivity to freons and hydrocarbons.

"Zeroing" the Instrument

Many monitoring instruments permit the user to "zero" or "fresh air calibrate" the device. This should never be permitted at the scene for two reasons. First, small amounts of contaminants from the environment can enter the instrument's detection chamber before the instrument's sensitivity can register it. In effect, zeroing the meter removes this initial exposure from the reading of the total exposure.

Second, zeroing the meter removes incidental background readings. Keep in mind that even pollen and perfume are measurable contaminants. Zeroed meters start at "0." As a result, the meter has no lower values to go to if an interfering, saturating, or humid environment is encountered later. A background reading is a positive indication. When an atmosphere enters the chamber that the machine cannot process, the meter reading will deflect toward zero. This negative reading should be a serious warning to the responder!

Typical Causes of Instrument Limitations

This chapter stresses the fact that every monitoring instrument has its limitations. Some of these limitations are the result of human error (such as inaccurate calibration, interpretation, and operation). Other limitations are the result of the instrument itself (such as sensitivity to environmental conditions, sensor poisoning, and exceeded service intervals). These latter limitations are best eliminated by proper maintenance and attention to incident specifics.

Calibration, interpretation, and operation errors are best eliminated by extensive and repetitive training. Unfortunately, this type of activity can be tedious. As a result, it is extremely important for the Safety Officer and ASO-HazMat to help motivate personnel in these tasks.

Most calibration errors occur from incorrect potentiometer settings or incorrect identification of gas (type, quantity, or contaminations). Most interpretation errors occur because responders typically set the instrument parameters for one gas, and then forget to use the manufacturer's standard deviation tables when monitoring for unknown or other gas environments. Most operation errors occur because of insufficient instrument warning time (such as approaching contaminants faster than the device can analyze them and respond), incorrectly set audible warning levels, and inattention to, or unreadable, meter faces.

California Specialized Training Institute, 2019

Hazardous Material Spill response Chart

This chart provides values for a relative response of a combustible gas indicator (CGI) calibrated to various gases (referenced to hexane, toluene, or methane). Response varies from one sensor to another and the response of a sensor can change with age, so these data should be used for estimation purposes only.

With an instrument calibrated for hexane, toluene, or methane, but used to monitor for a different gas, the equivalent response in %LEL for that gas is obtained by multiplying the observed %LEL reading by the conversion factor.

Gas	Actual LEL in %	Conversion Factor (Multiplier)		
		Hexane	Toluene	Methane
Acetone	2.15	0.65	0.63	1.55
Benzene	1.3	0.87	0.84	2.07
Butadiene	2.0	0.88	0.85	2.10
Carbon monoxide	12.5	0.60	0.58	1.43
Ethyl acetate	2.0	0.81	0.79	1.93
Ethyl alcohol	3.3	0.60	0.58	1.43
Formaldehyde	7.0	1.96	1.90	4.67
Heptane	1.0	1.03	1.00	2.45
Hexane	1.1	1.00	0.97	2.38
Hydrogen sulfide	4.0	1.96	1.90	4.67
Methyl ethyl ketone	1.7	0.84	0.81	2.00
Methylene chloride	12.0	2.78	2.70	6.62
Methane	5.0	0.42	0.41	1.00
Pentane	1.5	0.71	0.69	1.69
n-Propyl acetate	1.7	0.77	0.75	1.83
n-Propyl alcohol	2.1	0.80	0.78	1.90
Styrene	1.1	1.24	1.2	2.95
Toluene	1.2	1.03	1.00	2.45
Trichloroethylene	12.5	0.59	0.57	1.40

Monitoring instruments typically cannot operate beyond specific parameters for weather and atmospheric. The effects of weather (such as humidity, temperature, and barometric pressure) and significant changes in altitude from which a device was calibrated can result in inaccurate readings or instrument failure. Atmospheric conditions, such as high concentrations or "saturation" of the instrument by contaminants, can result in instrument failure. For example, exposure to corrosive environments causes total failure in devices that employ heated elements to measure contaminants. Saturation can also cause sensor poisoning or failure, which can significantly affect the reliability of instrument readings.

Many monitoring sensors have a specific "shelf life" or "use by" date. Many sensors, for example, must be disposed of after one year or less, regardless of whether the sensor is still packaged or in the instrument. This can complicate the process for stocking and replacing sensors.

California Specialized Training Institute, 2019

For the Safety Officer, trying to remember the limitations of each device can be exhausting. To help streamline and schedule this process, use checklists! Another way to keep track of "use by" dates and other limitations is to use instrument limitation sheets. These documents provide a quick review of the instrument's operational limits and deviation or interpretation tables.

Monitoring and detection Equipment

A number of devices and instruments are available for testing unknown atmospheres. However, no single instrument can provide sufficient information to determine the safety of an unknown atmosphere. Each instrument or device has its own strengths, limitations, and "blind spots."

More complete and accurate information about the atmosphere being tested can be obtained by using several instruments and comparing the results. For example, when dealing with known contaminants, one can use a CGI to determine percent LEL levels, colorimetric tubes to estimate ppm concentrations, and a PID or FID to detect low ppm concentrations and to confirm CGI and detector tube responses. This is a method of cross-checking meters and detectors for confirmation or elimination purposes.

Monitoring and Detection Devices			
Activity	**Process**	**Method**	**Instrument Example**
Monitoring	Continuous	Energy source	CGI
		Reaction	TOX meter
Detection	One-time	Pos./Neg. response	Test paper/strip
		Specific identification	Gas chromatograph
		Combination	Colormetric tube

Any monitoring strategy for unknown atmospheres must employ a combination of these devices. Direct-read air monitoring instruments can help detect and identify hazardous atmospheres. The most effective instruments:

- Measure the potential for fire or explosion in specific atmospheres
- Monitor atmospheres for abnormal oxygen levels
- Detect the presence and measure levels of ionizing radiation
- Detect the presence of various toxic vapors and gases
- Detect the presence or absence of corrosive materials

Each instrument should be used to its maximum capability in evaluating an atmosphere. Many percentage LEL meters are now available with "methane elimination switches" that allow the user to determine if the meter response is due to methane or another gas. Inserting a charcoal filter into the sample line of a CGI or FID can provide similar information. Activated charcoal can be used to filter out complex hydrocarbons such as solvents, alcohols, and gasoline. Light hydrocarbon gases, such as methane, pass unaffected through the filter.

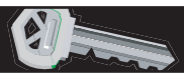
California Specialized Training Institute, 2019

Though it is very useful to have multiple instruments available at a response, the instrument user must be able to make sense of any readings that may appear to be conflicting or confusing, either singly or when compared with the others. A meter response from a properly functioning, calibrated instrument should never be disregarded because it does not match other readings.

Even an instrument that doesn't respond to an atmosphere is providing information that can be useful. A lack of response on a percent LEL meter, for example, doesn't mean that the atmosphere is devoid of contaminants. The lack of response only means that the level of the contaminant is too low or of a type that the instrument cannot detect. Non-response readings shouldn't be ignored. Instead, they provide another piece of information about what is, or isn't, in the atmosphere. *Any* information is valuable information.

California Specialized Training Institute, 2019

Chapter 8



Practical Exercises

Practical Exercises 8.1: Environmental Monitoring

Directions: Working independently, answer the following questions. Be prepared to discuss your answers with the entire class.

1. List some of the major and minor gases that compose a normal atmosphere and provide their corresponding concentrations.

2. What can make an unknown atmosphere hazardous?

3. What is the importance of measuring oxygen concentration levels when monitoring the atmosphere?

California Specialized Training Institute, 2019

Decontamination



Scope

This chapter discusses the methods and procedures that should be followed to protect the health and safety of responders and victims during decontamination operations.



Terminal Learning Objective (TLO)

At the end of instruction for Chapter 9, participants will be able to assess on-scene decontamination procedures in order to protect responder health and safety.



Enabling Learning Objectives (ELOs)

This chapter's enabling learning objectives are to ensure participants will be able to:

1. Explain what decontamination is and why it is important.
2. Examine measures to ensure responder safety during decontamination operations.
3. Summarize decontamination methods and procedures.
4. Describe procedures for decontaminating victims.

Supporting Materials/resource List

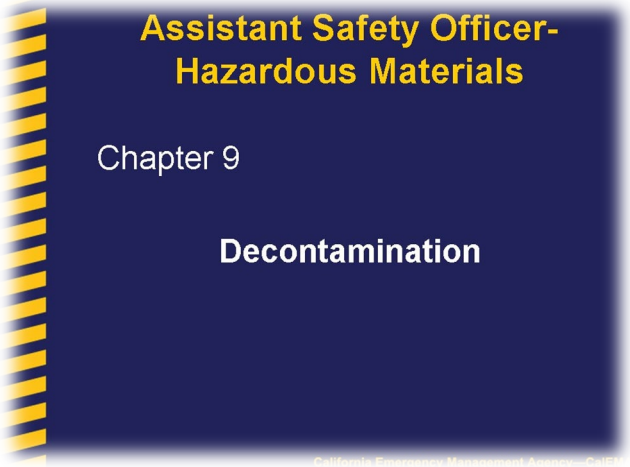
See Supporting Materials/Resource List section starting on page 387.



Practical Exercises

Note: No exercises are scheduled for this chapter.

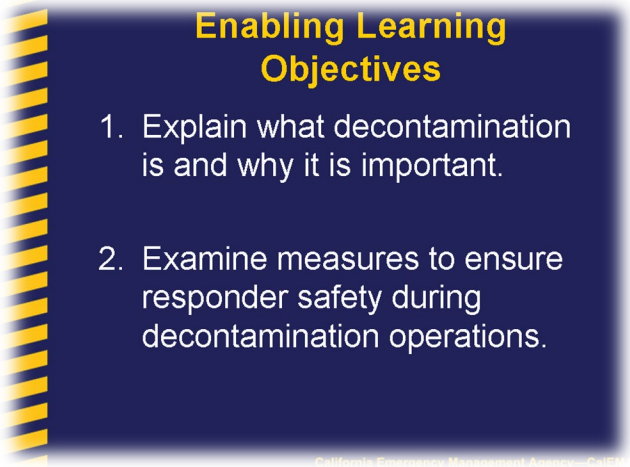
California Specialized Training Institute, 2019



Slide 9.1

The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

- (Res.B.2 1.2.2.1) Establish criteria for patient decontamination that fully considers the safety of EMS personnel and hospital-based first responders, knowing up to 80 percent of all victims will self refer to the nearest hospital.
- (Res.B.2 5.1.2.3) Develop a contamination site safety plan.
- (Res.B.2 5.5) Conduct decontamination.

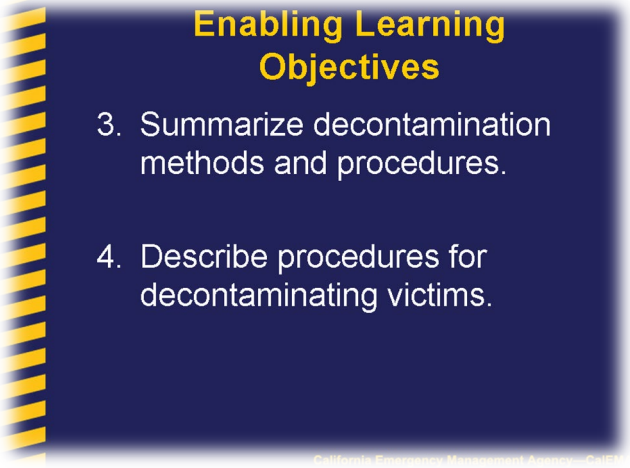


Slide 9.2

The goal (terminal learning objective) of this chapter is to ensure that participants will be able to assess on-scene decontamination procedures in order to protect responder health and safety.

This chapter's enabling learning objectives are to ensure participants will be able to:

1. Explain what decontamination is and why it is important.
2. Examine measures to ensure responder safety during decontamination operations.

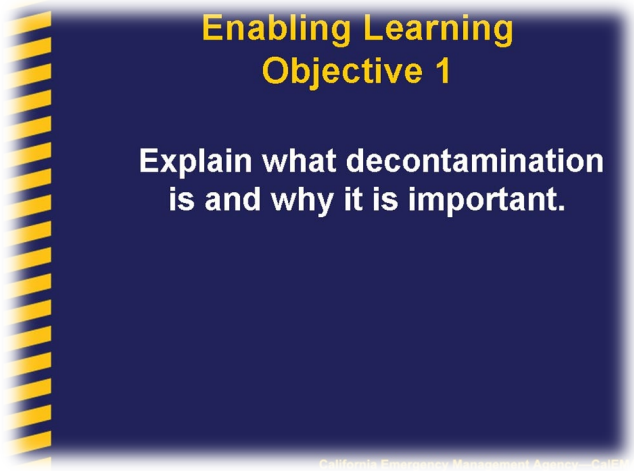


Slide 9.3

This chapter's enabling learning objectives will also ensure participants will be able to:

3. Summarize decontamination methods and procedures.
4. Describe procedures for decontaminating victims.

California Specialized Training Institute, 2019



Slide 9.4



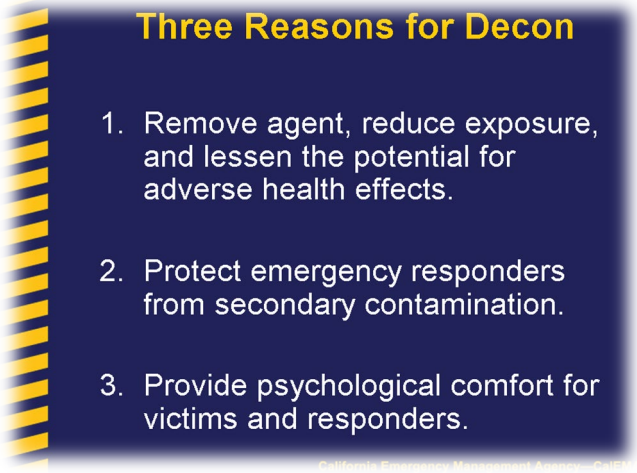
Slide 9.5

Decontamination, or "decon," is defined as the physical or chemical process of removing contaminants that have accumulated on persons, tools, and equipment.

The Occupational Safety and Health Administration (OSHA) defines decontamination as "the removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health effects" [29 CFR 1910.120(a)(3)].

Injuries resulting from unsafe post-incident practices, such as improper removal of protective clothing or the inadvertent introduction of contaminants into the home, have been reported over the years. These exposures can be eliminated by following proper decontamination procedures.

California Specialized Training Institute, 2019

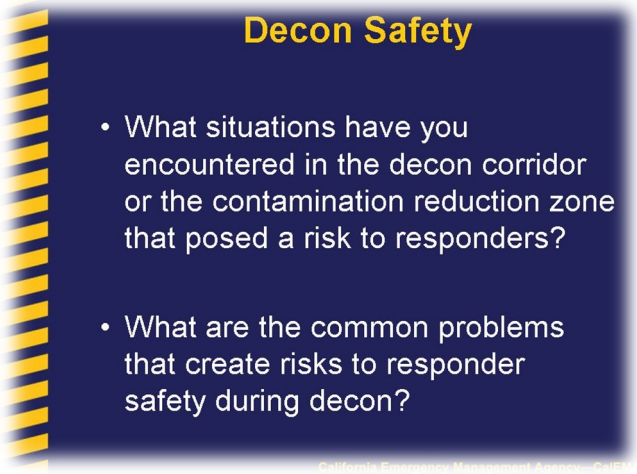


Slide 9.6

The three main reasons for conducting decontamination procedures are to:

1. Remove a contaminant, reduce exposure, and lessen the potential for adverse health effects.
2. Protect emergency responders from secondary contamination.
3. Provide psychological comfort for victims and responders.

Removing contaminants from personnel and equipment is critical to reducing the potential for contaminants to be transferred beyond the hazard area. Proper decontamination is especially important when victims or injured personnel must be transported to medical facilities.



Slide 9.7

As with any other emergency response procedure, five types of hazards are common sources of injury during the decon process. These hazards pose risks not only to responders, but also to victims who are "processed" through the decon corridor.

Environmental hazards include ambient temperatures, wind velocities, humidity, noise, glare, dust, darkness, and any other external condition that exceeds personal tolerance limits. These hazards may be a direct cause, or contributing cause, of injury.

Mechanical hazards, such as hoses and ladders, pose risks for slipping, tripping, falling, being punctured, and other injuries.

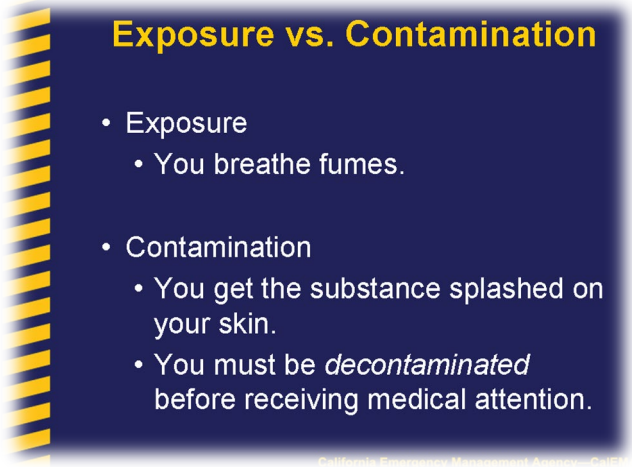
Physiological hazards include an array of conditions such as fatigue, over-exertion, strains, sprains, illness, and disease.

Chemical hazards are agents that cause disease, are carcinogenic, or are mutagenic. These hazards can be avoided or prevented by accurate identification of the hazard, use of protective clothing, and the decontamination process.

Psychological hazards arise from the demands of emergency incidents. These demands can cause stress, anxiety, confusion, disorientation, trauma, and fear.

By evaluating these hazards, the Assistant Safety Officer-Hazardous Materials (ASO-HazMat) can determine the types of threats to personnel as well as the probability that injuries may occur.

California Specialized Training Institute, 2019



Slide 9.8

There is a difference between being *exposed* and being *contaminated*. Exposure means a person has been subjected to a toxic or harmful agent. For example, if a person breathes the fumes of a hazardous liquid, he or she would then be considered "exposed" and may need medical attention.

However, if the product were to be splashed on a person's skin, he or she would be "contaminated." That person would need to be decontaminated *before* receiving medical treatment.

It is important to identify who has been exposed and who has been contaminated and, therefore, who should be decontaminated. If in doubt, have a person go through the decontamination process as a precautionary measure.



Slide 9.9

Secondary contamination, or cross-contamination, occurs when a contaminant is transferred beyond the safety zone. As victims are exposed to contaminant residue, they may carry the substance from areas of high concentration to areas of low concentration. This can easily happen when an individual walks through the hazardous substance, gets material on the soles of his or her shoes, and carries the contaminant wherever he or she walks.

Victims also may travel to the hospital on their own and unknowingly contaminate the emergency room. For example, when terrorists released the nerve agent sarin in the Tokyo subway in 1995, only 10 percent of the original victims were transported to the hospital by ambulance. The rest of the victims made their own way to the hospital, without having gone through any decontamination procedures. As a result, a number of secondary exposures occurred among hospital healthcare workers.

Keeping victims in the area of contamination, especially when the incident occurs in a geographically large area, can be challenging, but is absolutely necessary.

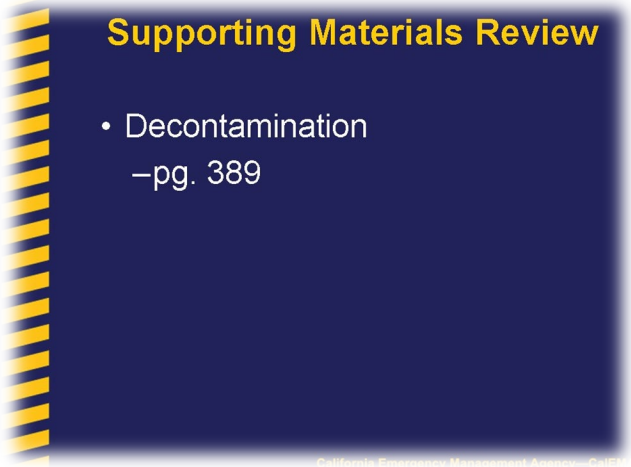
California Specialized Training Institute, 2019



Slide 9.10

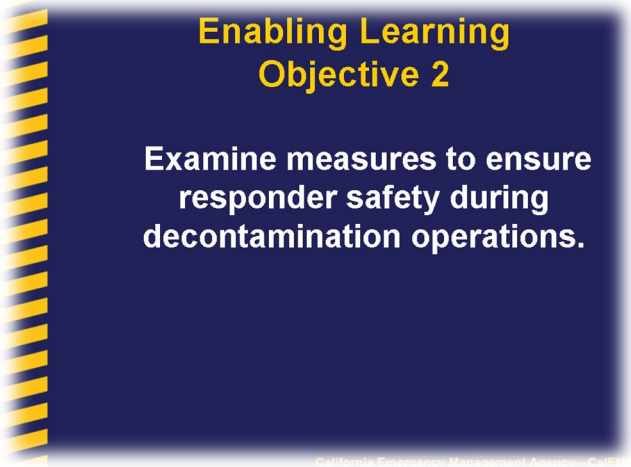
People and equipment exiting the exclusion zone are potential sources of secondary contamination—and injury—to personnel. These activities introduce contaminants to locations that previously were clean.

Contamination may spread as a result of improper decontamination practices, overspray, inadequate protective clothing, uncooperative victims and citizens, improper disposal techniques, insufficient training, inadequate security in the control zone, poor site management practices, failure to identify potential safety problems, and similar causes.



Slide 9.11

Review the listed supporting materials in the participant guide, page 389. It provides general information on the role of the ASO-HazMat and decontamination.



Slide 9.12

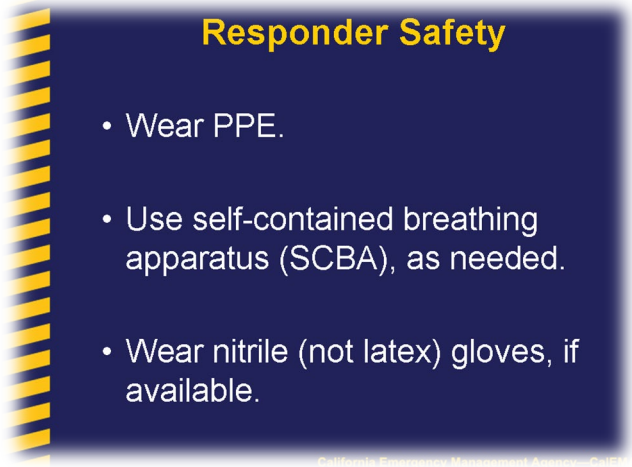
California Specialized Training Institute, 2019



Slide 9.13

The decon components of a site safety plan should, at a minimum, include:

- Transfer of patients and victims
- Removal and disposal of contaminated clothing, tools, and equipment
- Procedures to reduce overspray
- Doffing protocols
- Any other practices required to eliminate the spread of contamination

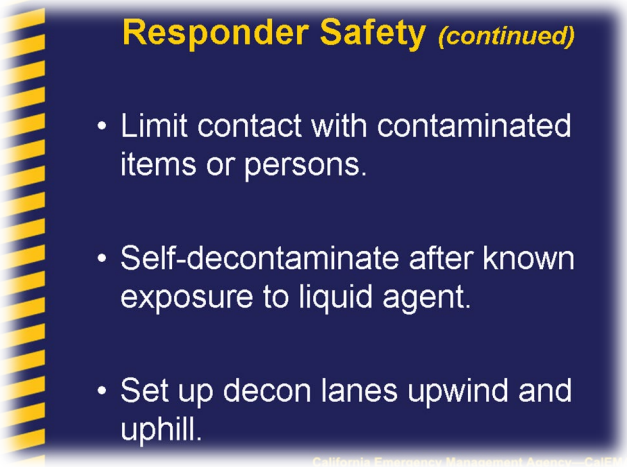


Slide 9.14

In any incident involving contaminants, the safety of responders is paramount. It is the responsibility of the ASO-HazMat to ensure that responders:

- Wear required personal protective equipment (PPE).
- Use self-contained breathing apparatus (SCBA), as needed. Any personnel who are in contact with, or have the potential to come in contact with, contaminated victims must wear protective clothing and respiratory protection. Structural firefighting clothing and SCBA or Level-B chemical protective clothing can provide adequate protection for responders who operate in the warm zone.
- Wear nitrile (not latex) gloves, if available.

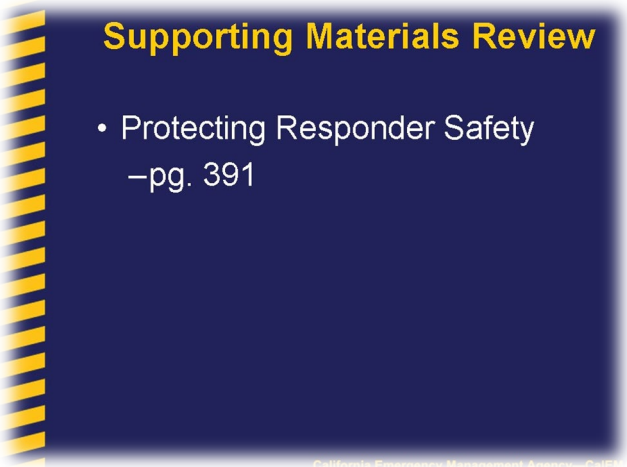
California Specialized Training Institute, 2019



Slide 9.15

- Minimize contact with contaminated victims and avoid contact with liquid, if at all possible.
- Self-decontaminate as soon as possible to avoid serious effects after a known exposure to liquid chemical agent. Moreover, any responders who operate in the warm zone should consider themselves contaminated.
- Monitor one another for signs and symptoms of exposure.

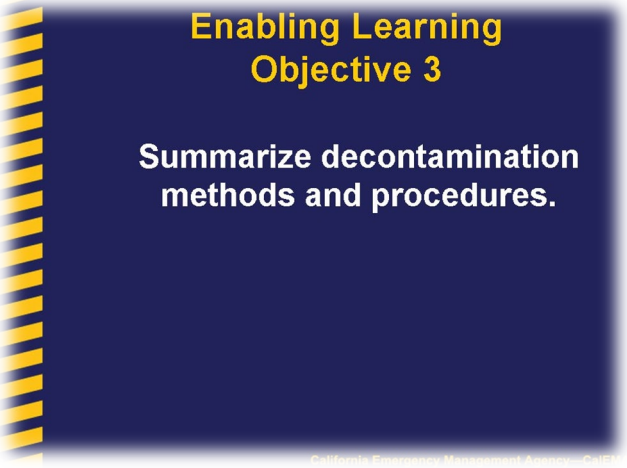
In addition, the ASO-HazMat should ensure that decontamination lanes are set up *upwind* and *upgrade*. If at all possible, the decon lanes should also be set up so that any runoff will flow back into the hot zone.



Slide 9.16

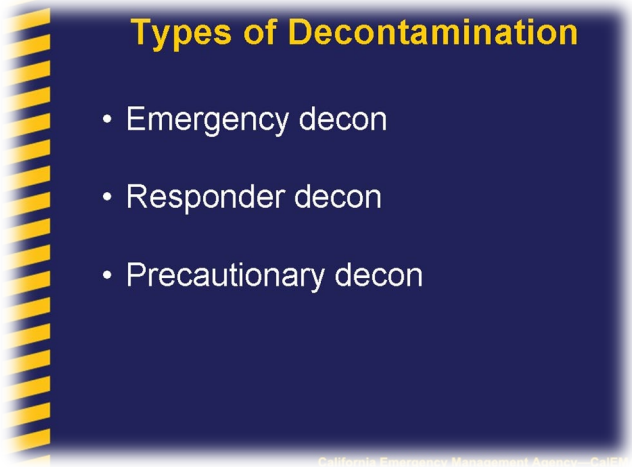
Review the listed supporting materials in the participant guide, page 391.

This section provides the names of Web sites and a database for detailed information on decontamination procedures, washing solutions, corridor layouts, and other topics related to responder safety and hazardous materials decontamination.



Slide 9.17

California Specialized Training Institute, 2019

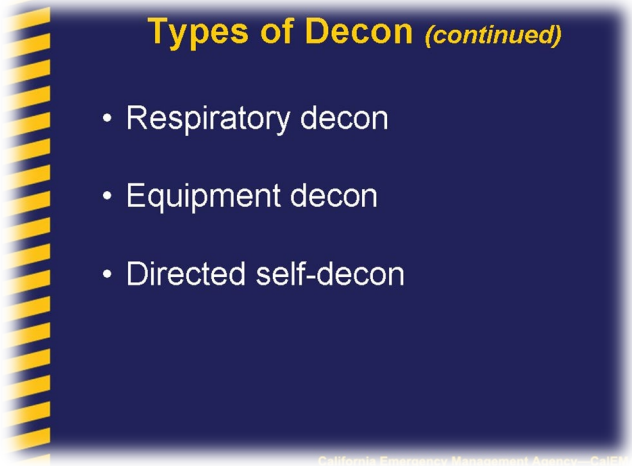


Slide 9.18

Emergency decon is an urgent and field-expedient decon process. It is most often performed on civilians or response personnel who have been exposed directly to a hazardous solid, liquid, mist, smoke, or certain gases, and who display related symptoms of exposure.

Responder decon refers to procedures that are performed on personnel who work in the exclusion zone or the contamination reduction zone at an event involving hazardous materials or weapons of mass destruction.

Precautionary decon generally refers to decontamination provided to civilians who display symptoms related to contamination and have been through emergency decon.



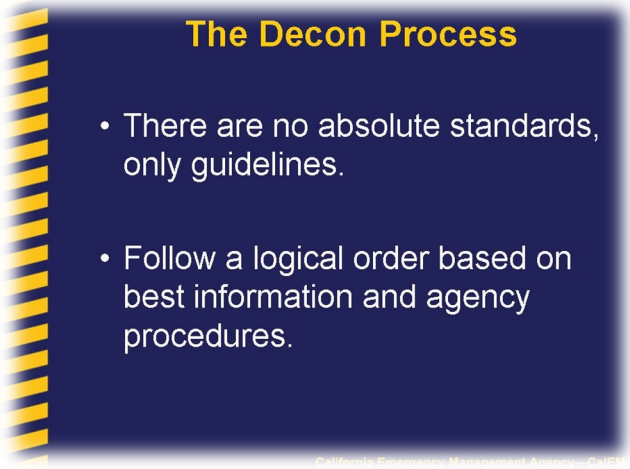
Slide 9.19

Respiratory decon is provided to persons who have been exposed to a toxic gas, but who pose little or no risk of secondary contamination to rescue and emergency medical services personnel.

Equipment decon is used to clean equipment so that it can be returned to service.

Directed self-decon refers to the process of victims conducting decon on themselves.

California Specialized Training Institute, 2019

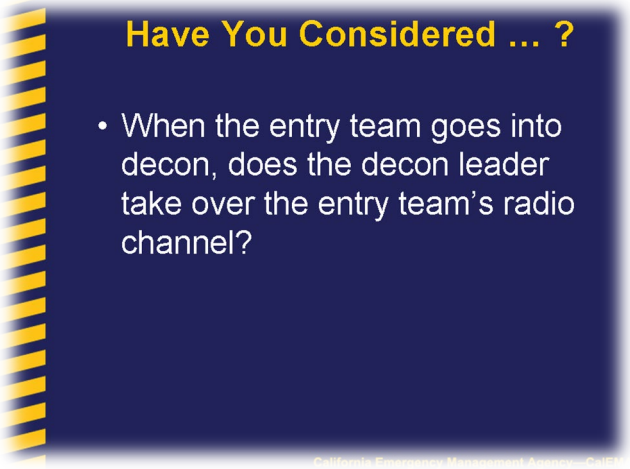


Slide 9.20

It is important to understand that even though a standard definition for decontamination exists, no absolute standards have been established for the decontamination process. There are only guidelines.

This is, in part, because the levels of contamination will vary depending on the agent/s involved. In addition, the types and levels of protective clothing used for decon may vary from agency to agency. However, decontamination must be performed anytime contamination is suspected.

Effective decontamination can be an involved and arduous process. It is extremely important to follow a logical order based on best practices. Places where contaminants typically hide, such as pass-throughs, garment folds, and modesty areas (arm pits and crotch), are easily overlooked. The protective clothing that decon personnel wear can also hinder effective decontamination.



Slide 9.21

Simple as it sounds, very few jurisdictions have the decon leader use the entry team's radio channel when the entry team goes into decon. This may make communication easier for entry personnel in the decon corridor.

California Specialized Training Institute, 2019



Slide 9.22

Dilution is the use of water to flush off or dilute contaminants from persons, protective clothing, tools, and equipment.

Sorbents function by "taking in" or assimilating a substance through the use of absorption and adsorption.

Disposal, or discarding, is the process of removing and disposing of the contaminated clothing and equipment.

Neutralization refers to the chemical alteration of the contaminant from its original form into an innocuous or less harmful state.



Slide 9.23

Decomposition is the process of reducing substances to a lesser condition, quality, or level. It also is commonly referred to as chemical or physical degradation.

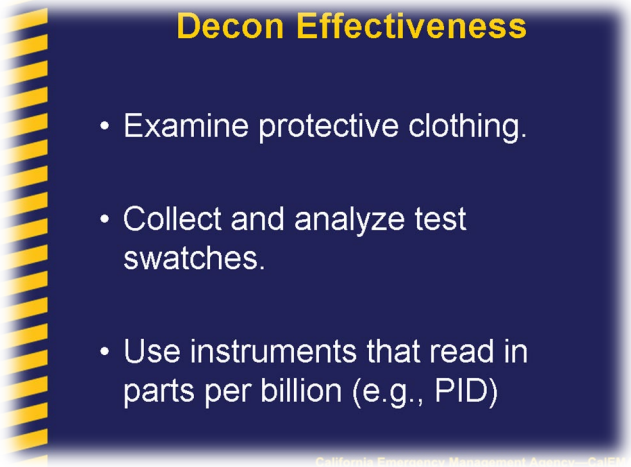
Evaporation draws off some of the material through vaporization.

Solidification renders materials into solid, compact, or hard forms.

Vacuuming uses suction mechanisms to vacuum contaminants from people and equipment.

Washing is the process of removing soluble matter by adding a surfactant or surface tension modifier (soap, detergent, bleach, etc.) to a solvent, such as water or alcohol. In many cases, simple washing with clean water and/or soap may be sufficient.

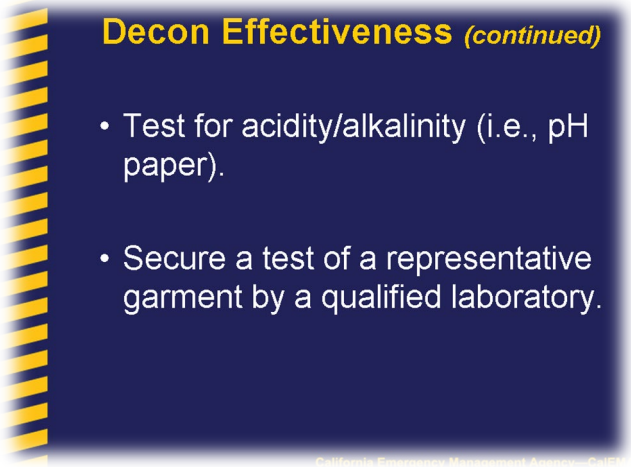
California Specialized Training Institute, 2019



Slide 9.24

There are a number of ways to check the effectiveness of decontamination on protective clothing. Keep in mind, however, these methods are not always accurate or practical. To check effectiveness on clothing:

- Visually examine protective clothing for signs of discoloration, degradation, or any corrosive effects.
- Collect and analyze test swatches or wipe samplings.
- Use instruments, such as photoionization detectors (PIDs); some read as low as in parts per billion.

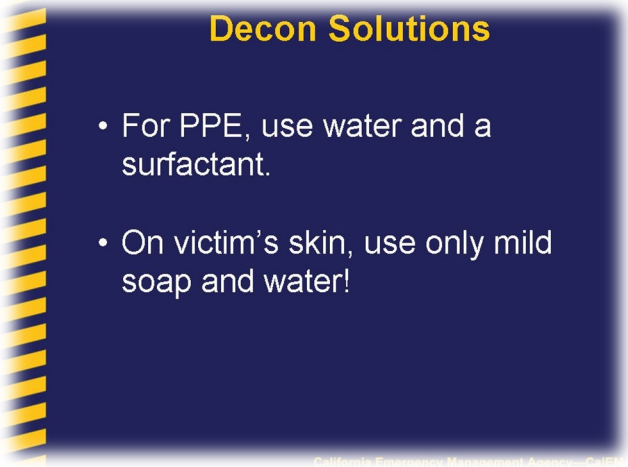


Slide 9.25

In addition:

- Test for acidity/alkalinity.
- Secure a test of a representative garment by a qualified laboratory.

California Specialized Training Institute, 2019



Slide 9.26

Numerous liquid products can be used for technical decontamination of equipment. When some of these solutions are combined with chemicals, they can produce adverse effects. The adverse effects might be as minimal as an exothermic reaction (giving off heat). However, adverse effects might include the release of toxic gases, which could be harmful to victims.

Examples of recommended decon solutions include:

- Mixtures of sodium hypochlorite (bleach)
- Isopropyl alcohol
- Calcium hypochlorite

Although these mixtures may be effective for use on equipment, they *should not be used on victims' skin***.** Only mild soap and water should be used as a decon solution for victims' skin.



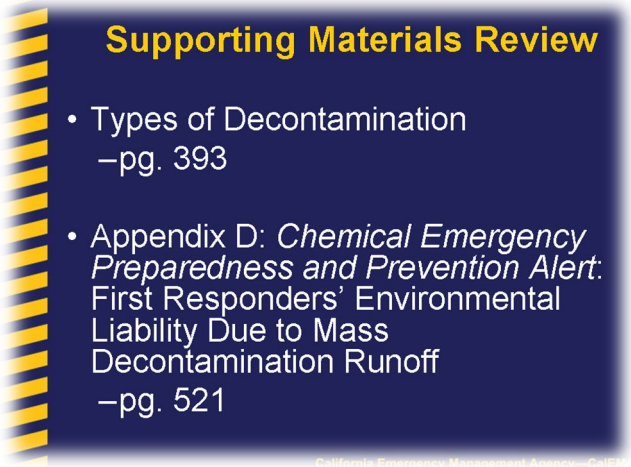
Slide 9.27

Although the primary concern in mass decontamination is saving lives, responders should also monitor the direction of runoff. Personnel should control runoff to the extent possible and have a good idea where the runoff is going. This will prevent cross-contamination between lanes and between zones and prevent runoff that may flow into clean areas or cause more casualties. If at all possible, given the available resources, confine the runoff to an isolated area. This is more critical for radiological materials, which cannot be neutralized.

The incident commander should notify the wastewater treatment facility as soon as possible when runoff is entering the sanitary sewer system or storm drains. For chemical warfare agents, some materials will be hydrolyzed by water and will not present a long-term problem downstream. Mustard agents and VX are notable exceptions; however, both can be diluted with large volumes of water. For biological agents, downstream contamination will vary depending on the agent and how well it survives in treated water. These agents will not present a hazard to humans, unless the contaminated water is ingested or enters the body via cuts, abrasions, or through the mucous membranes. For radiological materials, downstream "hot spots" (where the materials have collected as sediments) can cause a radiation hazard.

Responders will not be held liable by the EPA for runoff in a chemical or biological incident caused by a terrorist.

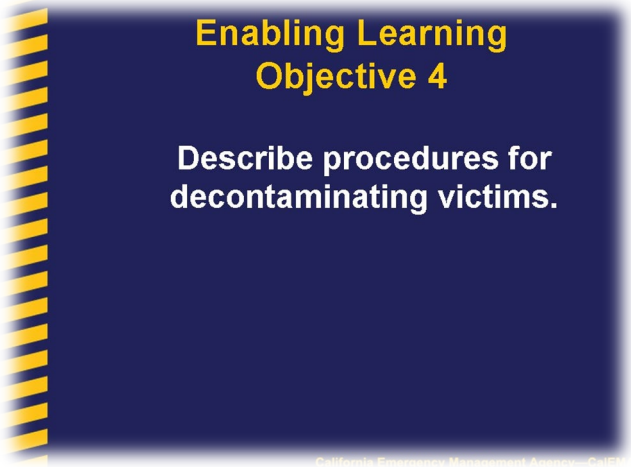
California Specialized Training Institute, 2019



Slide 9.28

Review the listed supporting materials in the participant guide, page 393.

Appendix D provides the complete text for the EPA's findings on acceptable levels of contamination in runoff and first responder liability for the spread of contamination caused by efforts to save lives.



Slide 9.29



Slide 9.30

Decontamination zones and corridors should be established quickly and marked clearly. The hot zone, or exclusion zone, contains the refuge area, which is for holding victims who are known to be contaminated. The safe refuge area, which is for holding victims who probably are *not* contaminated, should be located adjacent to the decon corridor.

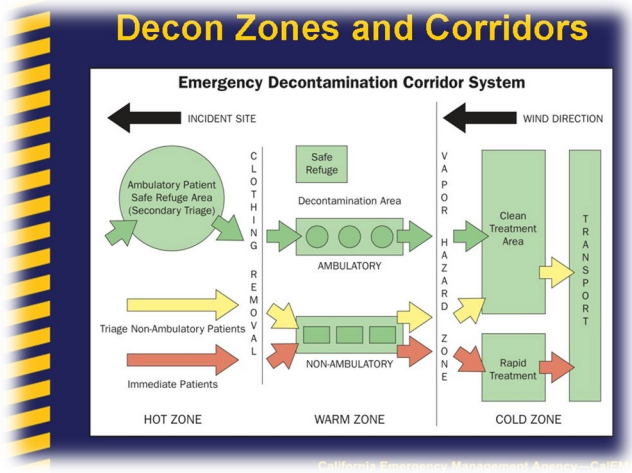
As mentioned earlier, the contamination reduction zone (CRZ), or warm zone, should be located upwind and upgrade from the hot zone and, if at all possible, so that any runoff will flow back into the hot zone.

California Specialized Training Institute, 2019

The contamination reduction corridor (CRC) must be located in an area that is safe to work in initially (setup) without the need for SCBA or specialized chemical protective clothing. However, once the CRC is in place (but before the CRC is used), decon personnel must don SCBA and protective clothing, as appropriate. All other personnel should leave the CRZ.

The CRC's boundaries should be marked off with specific access and egress points. Barricade tape, delineators, cones, or natural barriers are effective as markers. A recommended size for the CRC is approximately 20 feet by 75 feet. The important point about size is to ensure that the CRC is large enough for decon personnel to work in comfortably, given the complexity of the specific decon process.

Set up the support zone, or cold zone, around the warm zone in an area that is free of contamination and where emergency operations can be easily directed and supported.



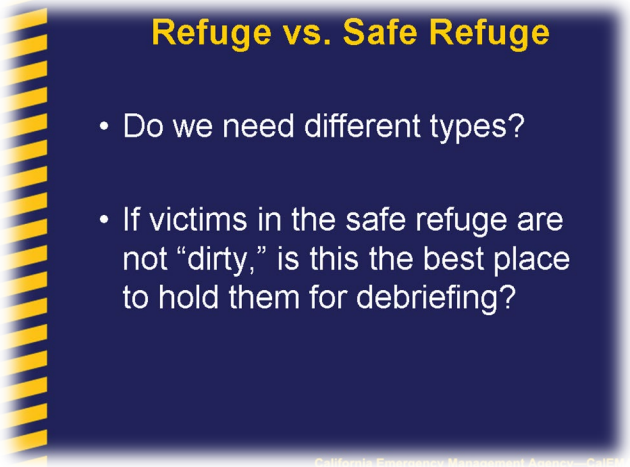
Slide 9.31

This graphic provides more detail on the activities conducted within the different decon zones and corridors.

The number of apparent victims from a chemical agent terrorist incident may exceed emergency responders' capabilities to effectively rescue, decontaminate, and treat victims, whether or not they have been exposed to a chemical agent. As a result, responders must prioritize victims for receiving decontamination, treatment, and medical evacuation, while providing the greatest benefit for the greatest number.

Although many emergency response services prepare for such incidents, few are currently capable of treating victims inside the hot zone. Therefore, whenever large numbers of victims are involved, they should be sorted into ambulatory casualties and non-ambulatory casualties.

Ambulatory casualties are victims who are able to understand directions, talk, and walk unassisted. Non-ambulatory casualties are victims who are unconscious, unresponsive, or unable to move unassisted.



Slide 9.32

Do we need different types of refuge areas?

If victims in the safe refuge are not "dirty" (contaminated), is the safe refuge the best place to hold them for debriefing?



Slide 9.33

This photograph shows a safe refuge area.

The incident was an anthrax scare at a Mervyn's store in Palm Desert, California. Two hundred twenty-nine people were held at the department store and decontaminated.



Slide 9.34

Decon corridors should be constructed simply and efficiently, keeping in mind that time is critical. (They should not take more than a few minutes to set up.)

Consider erecting dual corridors to separate genders. Also, consider segregating symptomatic and asymptomatic victims, as time and resources permit.

California Specialized Training Institute, 2019



Slide 9.35

Draping tarps over ladders or vehicles offers a simple and efficient method for building an effective corridor.



Slide 9.36

This slide illustrates the Emergency Decontamination Corridor System (EDCS), which uses fire apparatus, ladders, and salvage covers to create a privacy barrier and corridors for decontaminating victims.

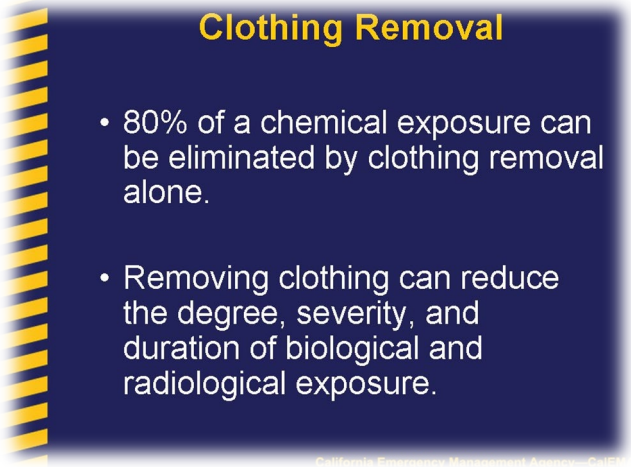
Typically, two pumpers are positioned approximately 20 feet apart and parallel to each other. Three ladders (or ropes) are placed across and secured to the top of each pumper.

Another ladder is centered atop and perpendicular to the three ladders and secured. Two nozzles are secured to this ladder and allowed to hang into the corridors. Salvage covers are attached to or draped over the ladders (or ropes) to provide two separate corridors. Water from the two nozzles is used to shower victims as they pass through the corridors.

Inside the corridor, two covers can be suspended from the ladder, one on each side of the nozzle. These covers provide additional privacy to the person who is showering and allow other people to prepare for showering in the corridor. A salvage cover (or other translucent or opaque material) is placed on top of the two corridors to provide privacy from building tops and news media helicopters.

With planning and practice, an EDCS can be set up within 15 minutes or less of arriving at an incident.

California Specialized Training Institute, 2019



Slide 9.37

A number of methods can be used to decontaminate victims from exposure to harmful materials. The first step in mass decontamination should be the simple act of clothing removal. It is estimated that up to 80 percent of a chemical exposure can be eliminated by clothing removal alone.

Removing clothing can reduce the degree, severity, and duration of biological and radiological exposure as well. While complete removal of clothing may be necessary under some circumstances, at a minimum, victims should be advised and encouraged to remove all outer clothing (down to uncontaminated undergarments).

Victims who decline or refuse to remove clothing should not be physically coerced, but should be showered as soon as possible and isolated from those who have been fully decontaminated.



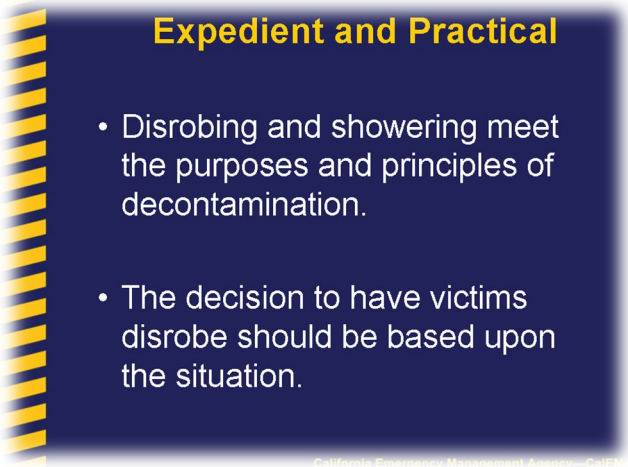
Slide 9.38

Generally, it is unnecessary to put victims through the same decon procedures as that for responders in chemical protective clothing. Whether the situation calls for emergency or precautionary decon, victims who are conscious, alert, and ambulatory should be directed to disrobe to the appropriate level and to wash themselves. As noted earlier, this is known as directed self-decontamination.

Directed self-decontamination is important for a number of reasons. First, victims are more likely to do a thorough job decontaminating themselves than responders. (However, it is important to warn victims that it is easy to overlook places where contaminants typically hide, such as in garment folds and modesty areas.)

In addition, directed self-decontamination helps reduce victims' psychological trauma and is sensitive to gender and cultural differences. Moreover, it saves valuable resources by freeing responders to do other things.

California Specialized Training Institute, 2019



Slide 9.39

Decontamination by removing clothes and flushing or showering with water is the most expedient and the most practical method for mass casualty decontamination.

Disrobing and showering meet all the purposes and principles of decontamination. Showering is recommended whenever liquid transfer from clothing to skin is suspected. For a chemical incident, OSHA recommends a high-volume, low-pressure shower process.

Disrobing should occur before showering for chemical agents.



Slide 9.40

Make all attempts to protect victims' modesty in situations where they are required to remove their clothing.

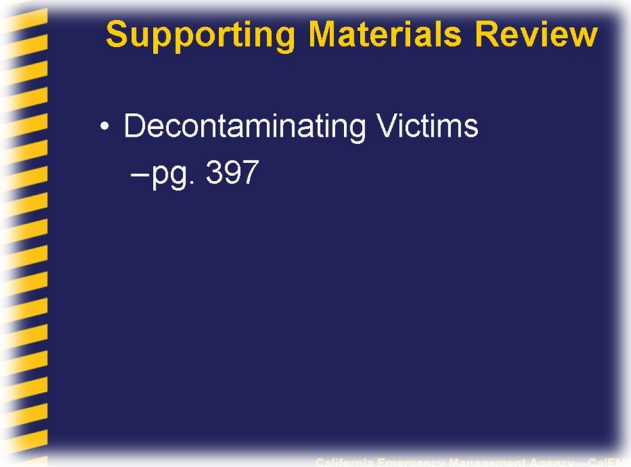
Many items, such as salvage covers, shelters, engines, blankets, etc., will be available to provide privacy.



Slide 9.41

At the Mervyn's incident depicted in a previous slide, victims were provided with garments or coverings after the decon process to protect their modesty.

Plastic bags should be available for personal items, wallets, jewelry. The identity of the items' owner should also be marked on each bag.



Slide 9.42

Review the listed supporting materials in the participant guide, page 397.



Slide 9.43

The decontamination process can be technically involved and extensive. As a result, the ASO-HazMat must ensure that a decon plan is implemented and should consider using technical specialists when necessary.

The ASO-HazMat may not need to perform actual procedures, but he or she must be:

- Knowledgeable about decon operations
- Willing to ask questions about the methods being used and the risks they may pose for responders
- Familiar with hazmat procedures

As is the case with any procedure for emergency response, successful implementation of decontamination requires regular training and practice.

California Specialized Training Institute, 2019

Chapter 9



Supporting Materials/ Resource List

Decontamination

Decontamination, or "decon," is defined as the physical or chemical process of removing contaminants that have accumulated on citizens and personnel, tools, and equipment. The Occupational Safety and Health Administration (OSHA) defines decontamination as "the removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health effects." [29 CFR 1910.120(a)(3)]. Proper decontamination assures that the potential for subsequent injury to victims, responders, and family members and damage to equipment is eliminated.

It is important to understand that although we have a standard definition for decontamination, no absolute standards for decontamination procedures exist—only guidelines. This is in part because the levels of contamination will vary depending on the agent(s) involved in an incident and because agencies provide different types and levels of protective clothing. However, decontamination must be conducted whenever contamination is suspected.

Determining the effectiveness of decontamination procedures is not always easy. This is particularly true when people have become contaminated. Cases have been reported over the years of responders improperly removing protective clothing and inadvertently introducing contaminants into the home, thus exposing household members.

The effects of contamination may not become apparent for weeks, months, or even years. Some contaminants can accumulate in and weaken the body over time. Some combine with other substances in the body and become even more toxic (this is known as synergism). Many contaminants can cause cancers and respiratory problems later in life. For this reason, immediate and continued medical monitoring should be done for contaminated persons.

Sources of Injury

The primary sources of potential chemical injuries to incident personnel are people and equipment exiting the exclusion zone. These sources bring contamination to locations that previously were clean. Decontamination operations also have the potential to further the spread of harmful agents. This may result from improper decontamination practices, overspray, inadequate protective clothing, uncooperative victims and citizens, poor disposal techniques, inadequate training, poor control zone security, and similar causes. The Assistant Safety Officer-Hazardous Materials (ASO-HazMat) needs to be knowledgeable about the technical aspects of decontamination, proper corridor layout, and other safety methods in order to identify and eliminate potential problems.

Generally there are five types of hazards through which all injuries occur: environmental, mechanical, physiological, chemical, and psychological. There is the potential for each of these hazards to occur during the decontamination process, both for those working in the decon corridor and for those being "processed" through it. By evaluating these hazards, the ASO-HazMat can determine the types of threats to personnel, as well as the probability of occurrence.

Environmental hazards are exacerbated by ambient temperatures, wind velocities, humidity, noise, glare, dust, darkness, and any other condition that exceeds personal tolerance limits. Such hazards may become a direct or indirect cause of injury. These conditions also can be the most difficult to eliminate, change,

California Specialized Training Institute, 2019

or control. To protect hazmat responders, the ASO-HazMat may have to provide shelters, limit exposure times, add protective devices, or alter the working environment.

Mechanical hazards are common sources of injury in decon zones. Injuries may arise from falling, tripping, striking, or from pressure, radiant sources, penetration, and other causes. Falling injuries may be due to poor visibility or to limited mobility and inhibited dexterity created by protective clothing. Tripping hazards include hoses, pool lips, tarp edges, and other material obstacles. Cuts can occur from sharp edges, points, or abrupt compression.

Responders typically limit the size of the decon area to the width of their single, largest tarp. This results in a cramped and unsafe work area with many hazards. This is usually true for the length of the CRZ as well. Doffing areas tend to be too close to the washing areas, allowing over-spray to contaminate unprotected personnel. This work area needs to be as wide and long as is necessary to safely conduct the required tasks and eliminate the spread of contamination.

Physiological hazards, such as strains, sprains, over-exertion, fatigue, illness, and disease, may occur at the event or prior to the incident. Either situation renders responders less fit for duty and more prone to further injuries. The effects of insomnia, sunburn, allergies, exertion, and minor infections are often overlooked, but may greatly affect an individual's ability to perform. ASO-HazMats can eliminate potential injuries that result from these causes by participating in pre-entry fitness evaluations.

Chemical hazards include agents that may cause acute/chronic injury, cancer, and birth defects. These chemical hazards are avoided or prevented through proper hazard identification, protective clothing, and decontamination procedures.

Psychological hazards arise from the demands of emergency incidents. These hazards can cause stress, anxiety, confusion, disorientation, and fear. For example, certain types of locations may trigger agoraphobia or other psychological problems in some responders. Protective clothing may induce claustrophobia. (In fact, many responders experience an adverse psychological effect at some point in their careers when climbing into or wearing protective clothing.)

Psychological sequelae are more likely to occur at incidents where injuries have already occurred or where the risks to health and safety are potentially high. ASO-HazMats should be sensitive to these issues and the subsequent embarrassment, loss of self-esteem, and/or depression that responders may experience. Information on Employee Assistance Programs and Critical Incident Stress Debriefing should be a part of every ASO-HazMat's response kit.

California Specialized Training Institute, 2019

Protecting responder Safety

Although there is no specific standard for decontamination at every incident, the process should follow a logical order. Contaminated people and equipment should flow from the dirty end (the area of highest contamination), to the clean end (the area of least contamination). Supplies and equipment should flow from the clean side to the dirty side. A multiple-step process should be used to reduce contaminants to an acceptable level. This reduces the concentration of contaminants in any given area. The exact approach will be made based on the hazards involved and the complexity of the situation.

Part of the safety official's task is to ensure that the approach to decontamination is developed and implemented as part of the site safety plan. This plan should include components that cover the transfer of patients and victims; removal and disposal of contaminated clothing, tools, and equipment; procedures to reduce overspray; doffing protocols, and any other practices required to eliminate the spread of contamination.

It is also the responsibility of the ASO-HazMat to ensure that responders:

- Wear required personal protective equipment (PPE).
- Use self-contained breathing apparatus (SCBA), as needed. Any personnel who are in contact with, or have the potential to come in contact with, contaminated victims must wear protective clothing and respiratory protection. Structural firefighting clothing and SCBA or Level-B chemical protective clothing can provide adequate protection for responders who operate in the warm zone.
- Wear nitrile (not latex) gloves, if available.
- Minimize contact with contaminated victims and avoid contact with liquid, if at all possible.
- Self-decontaminate as soon as possible to avoid serious effects after a known exposure to liquid chemical agent. Moreover, any responders who operate in the warm zone should consider themselves contaminated.
- Monitor one another for signs and symptoms of exposure.

In addition, the ASO-HazMat should ensure that decontamination lanes are set up *upwind* and *upgrade*. If at all possible, the decon lanes should also be set up so that the runoff will flow back into the hot zone.

Information Sources

Information on decontamination procedures, washing solutions, corridor layouts, and other topics is available in numerous textbooks and standard reference sources. Technical assistance Web sites, such as CHEMTREC, CHLOREP, and TOXNET, are additional sources of information. Advice may also be obtained from computer database programs, such as Micromedix—TOMES. In addition, decontamination information for specific materials is available from chemical manufacturers.

California Specialized Training Institute, 2019

Types of decontamination

There are six general categories of decontamination: emergency decontamination, responder decontamination, precautionary decontamination, respiratory decontamination, equipment decontamination, and directed self-decontamination.

- Emergency decontamination, or emergency decon, refers to decontamination that is urgent and field expedient. Emergency decon is most often performed on civilians or response personnel who have been exposed directly to a hazardous solid, liquid, mist, smoke, or certain gases and who display related symptoms of exposure.

  Emergency decon is a two-stage process. The first stage consists of clothing removal and a gross two-to-five minute water rinse. The second stage is a soap-and-water scrub and rinse. Exposure to the eyes might call for flushing for 15 minutes or longer. The environment and personal modesty are not of primary importance when there are potentially life-threatening injuries or exposures. Emergency decon may be followed by precautionary decontamination, if deemed necessary by local protocol, the hazardous materials team, and/or the Poison Control Center.

- Responder decontamination, or responder decon, refers to decontamination procedures that are performed on personnel who work in the exclusion zone or the contamination reduction zone at an event involving hazardous materials (hazmat) or weapons of mass destruction (WMD). This generally includes hazmat entry and decontamination teams working in Level A or Level B protective clothing, but may include law enforcement force protection squads and emergency medical service (EMS) personnel who work in Level C chemical protective clothing.

- Precautionary decontamination, or precautionary decon, generally refers to decontamination that is conducted on civilians who have been through emergency decon and display symptoms related to contamination. Precautionary decon may also be appropriate for those who may have been exposed to hazardous chemicals, but who are *not* displaying any related symptoms of contamination.

  Precautionary decon allows enough time to contain runoff water and to protect personal modesty through the use of through the use of containment basins and/or showers, tents, trailers, and tarps. (In situations where injuries or exposures are immediate and life-threatening, measures to contain runoff water and protect modesty are generally too time-consuming. Instead, emergency decon should be conducted.) Precautionary decon may be a first step if emergency decon is not required. However, the ASO-HazMat should ensure that no suspected contamination leaves the incident site.

- Respiratory decontamination, or respiratory decon, is conducted on indivduals who have been exposed to a toxic gas, but who pose little or no risk of secondary contamination to rescue and EMS personnel. Respiratory decon may be required as victims begin to display symptoms related to exposure. Respiratory decon involves removing victims from the hazardous environment and relocating them to a clean and safe location. Respiratory decon may include the administration of oxygen. Victims' bulky clothing, which is capable of trapping gas, should be removed out of doors before the victims are turned over to medical personnel.

California Specialized Training Institute, 2019

- Equipment decontamination, equipment decon, is used to clean equipment so that it can be returned to service. This process refers to cleaning equipment that has been contaminated during incident mitigation or to additional cleaning of personal protective equipment once responders have returned to the station.
- Directed self-decontamination is the term used for directing conscious, alert, and ambulatory victims to disrobe to the appropriate level and to wash themselves, using either an emergency or precautionary decontamination process. *Special Note*: Generally, it is unnecessary to put civilian victims through the same decon procedures as those for responders who wear chemical protective clothing.

The decontamination Process

Although there are no absolute standards, only guidelines, for the decontamination process, it is important to follow a logical order, based on best practice and standard operating procedures. For example, outer, more heavily contaminated items (i.e., outer boots and gloves) should be decontaminated and removed first, followed by decontamination and removal of inner, less contaminated items. Each procedure may be performed at a separate station in order to prevent secondary contamination. These stations are located in the warm zone.

Entry and exit points should be conspicuously marked. Dressing stations for entry to the warm zone should be separate from redressing areas for exit from the warm zone. Personnel who wish to enter clean areas of the decontamination areas must be completely decontaminated.

Similarly, responders who initially come in contact with personnel and equipment leaving the exclusion zone will require more protection from contaminants than those who work in the support zone. In some cases, responders who perform decontamination procedures should wear the same types of protective clothing as responders in the exclusion zone. The hazard and extent of contamination will determine the appropriate level of protective clothing and equipment needed.

decontamination Methods

Specific decontamination methods depend on a number of factors, but primarily on the specific types of contaminants involved. Highly toxic materials/contaminants generally require more detailed and thorough decontamination procedures than do less toxic materials.

There are four basic methods of decontamination: dilution, sorbents, disposal, and neutralization.

- Dilution is the use of water to flush off or dilute contaminates from persons, protective clothing, tools, and equipment. It is both an expedient and readily obtainable method for decontamination. Water for dilution is generally plentiful at an emergency scene. The disadvantage to this procedure is the large amount of runoff that can be created and must then be dealt with appropriately. Water reactivity also should be considered before its application.
- Sorbents function by "taking in" or assimilating a substance through the use of absorption and adsorption. Adsorption is the "picking-up" of accumulated gases, liquids, and solutes on the surface of another solid or liquid, such as activated charcoal. These devices are more specialized than absorbents, such as sponges, and typically cost more. Adsorbents can be very useful in separating contaminants, such as oil and water, or when responders need to remove all materials simultaneously, and adsorbents

California Specialized Training Institute, 2019

do not require that responders "wring them out" for reuse. Cost, proximity of responders to contaminants in order to use adsorbents, and the subsequent contamination that can result while putting sorbents into disposal containers are all obstacles to using sorbent materials.

- Disposal or discarding is the process of removing and disposing of contaminated clothing and equipment. This method is the most expedient because items are simply containerized and thrown away. However, the costs of both equipment replacement and proper disposal can make this an expensive process. Generally, dilution and discarding are the preferred methods of removing contaminants. These methods are easy to implement, effective, and relatively inexpensive.
- Neutralization refers to chemical alteration of the contaminant from its original form into an innocuous or less-harmful state. The drawback of this approach to decontamination is that, unless it is careful, the agency that conducts this method of decontamination can become the new "owner" under Resource Conservation and Recovery Act laws.

The National Fire Protection Association Standard 472 also recognizes additional methods for decontamination, which include decomposition, evaporation, solidification, vacuuming, and washing, among others.

- Decomposition is the process of reducing substances to a lesser condition, quality, or level, yielding benign materials that can be dealt with safely. (This process also is commonly referred to as chemical or physical degradation.) Decomposition of the compound may occur in stages and produce well-defined intermediate products. A major obstacle to using decomposition or degradation is the process itself. The process can produce highly toxic intermediate products, release energy, and tends to be highly technical and costly.
- Evaporation draws off some of the contaminant through vaporization. This reduces the volume of the contaminant, thus reducing the costs for disposal or other processes. The major obstacle to using evaporation is that it typically releases various types and amounts of vapors into the atmosphere, spreading these contaminants, especially downwind. Many states prohibit the intentional atmospheric release of hazardous gases or vapors.
- Solidification renders contaminants into solid, compact, or hard forms, making them easier to deal with than fluid or gaseous ones. The process for solidification may involve cooling, evaporation, adsorption, or other means. The drawbacks to solidification are that potentially hazardous byproducts may be created and the processes tend to be highly technical and costly.
- Vacuuming uses suction mechanisms to remove contaminants from people and equipment. These wet or dry system devices use filtration to collect, remove, or neutralize substances. Vacuuming is an excellent process for powdered materials. However, this approach to decontamination may produce airborne contaminants, static electricity, and other hazards.
- Washing is the process of removing soluble matter by adding a surfactant or surface tension modifier (such as soap, detergent, or bleach) to a solvent (such as water or alcohol). The components required for this process are readily available, easy to apply, and usually are inexpensive. The problem with this approach to decontamination is that it often creates large volumes of potentially hazardous solution in runoff that must be contained and/or disposed of.

California Specialized Training Institute, 2019

Checking for the Effectiveness of decon on PPE

Decontamination can be an involved and arduous process to accomplish effectively. It is easy to overlook places where contaminants typically lodge, such as pass-throughs, garment folds, and modesty areas (arm pits and crotch). The process may also be hindered by the protective clothing worn by decon personnel.

There are a number of ways to check the effectiveness of decontamination on protective clothing. However, these methods are not always accurate or practical. To check effectiveness of clothing:

- Examine protective clothing for signs of discoloration, degradation, or any corrosive effects.
- Collect and analyze test swatches or wipe samplings.
- Use instruments, such as photoionization detectors (PIDs), that read in parts per billion.
- Test for acidity/alkalinity.
- Secure a test of a representative garment by a qualified laboratory.

Whenever it is known or suspected that a chemical has permeated PPE, the clothing should not be re-used.

All equipment used for decontamination must be decontaminated and/or disposed of properly. Buckets, brushes, clothing, tools and other contaminated equipment should be collected, placed in containers, and labeled. Also, all spent solutions and wash water should be collected and properly disposed of. Clothing that is not completely decontaminated should be placed in plastic bags, pending further decontamination and/or disposal.

The ASO-HazMat and response personnel should always refer to the agency's standard operating procedures and consult local hazardous materials plans to determine the proper disposal protocols.

Concerns about runoff and Liability

In a July 2000 *Chemical Emergency Preparedness and Prevention Alert*, the Environmental Protection Agency (EPA) addressed the issues of acceptable levels of contamination in runoff and first responder liability for the spread of contamination caused by efforts to save lives. While the EPA affirmed that any level of contamination represents a threat to the environment, the threat depends on many variables, including the involved chemicals, their concentrations, and the runoff watershed. In the bulletin, the EPA stressed that the highest priority for responders should be to save lives and preserve health. In the EPA's words, "first responders should undertake any necessary emergency actions to save lives and protect the public and themselves." The EPA also emphasized that once responders have addressed imminent threats to human health and lives, they "should immediately take all reasonable efforts to contain the contamination and avoid or mitigate environmental consequences."

In terms of liability, the EPA also found that responders are protected under the law when they take federally recommended actions in response to a chemical terrorist incident. This finding is the result of the EPA's interpretation of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which indicates that "no person shall be liable … for costs or damages as a result of actions taken or omitted in the course of rendering care, assistance or advice in accordance with the National Contingency Plan (NCP) or at the direction of an On-Scene Coordinator appointed under such plan …"

(For more information, see Appendix D, *Chemical Emergency Preparedness and Prevention Alert*: First Responders' Environmental Liability Due to Mass Decontamination Runoff.)

California Specialized Training Institute, 2019

decontaminating victims

Decontamination procedures for victims share many similarities as those for responders. For example, the overall goals of victim decontamination are to minimize the uncontrolled transfer of contaminants from the hazard site to clean areas; remove a contaminant, reduce exposure, and lessen the potential for adverse health effects; protect emergency responders from secondary contamination; and provide psychological comfort. However, there are differences as well. This section provides an overview of procedures for decontaminating victims, including mass decontamination.

Placement, Location, and Setup of Zones and Corridors

Decontamination zones and corridors should be established quickly and marked clearly. The hot zone, or exclusion zone, contains the refuge area, which is for holding victims who are known to be contaminated. Locate the safe refuge area, which is for holding victims who probably are *not* contaminated, adjacent to the decon corridor.

The contamination reduction zone (CRZ), or warm zone, should be located upwind and upgrade from the hot zone and, if at all possible, so that any run-off will flow back into the hot zone. The contamination reduction corridor (CRC) must be located in an area that is safe to work in initially (setup) without the need for self-contained breathing apparatus (SCBA) or specialized chemical protective clothing. However, once the CRC is in place (but before the CRC is used), decon personnel must don protective clothing as appropriate. All other personnel should leave the CRZ.

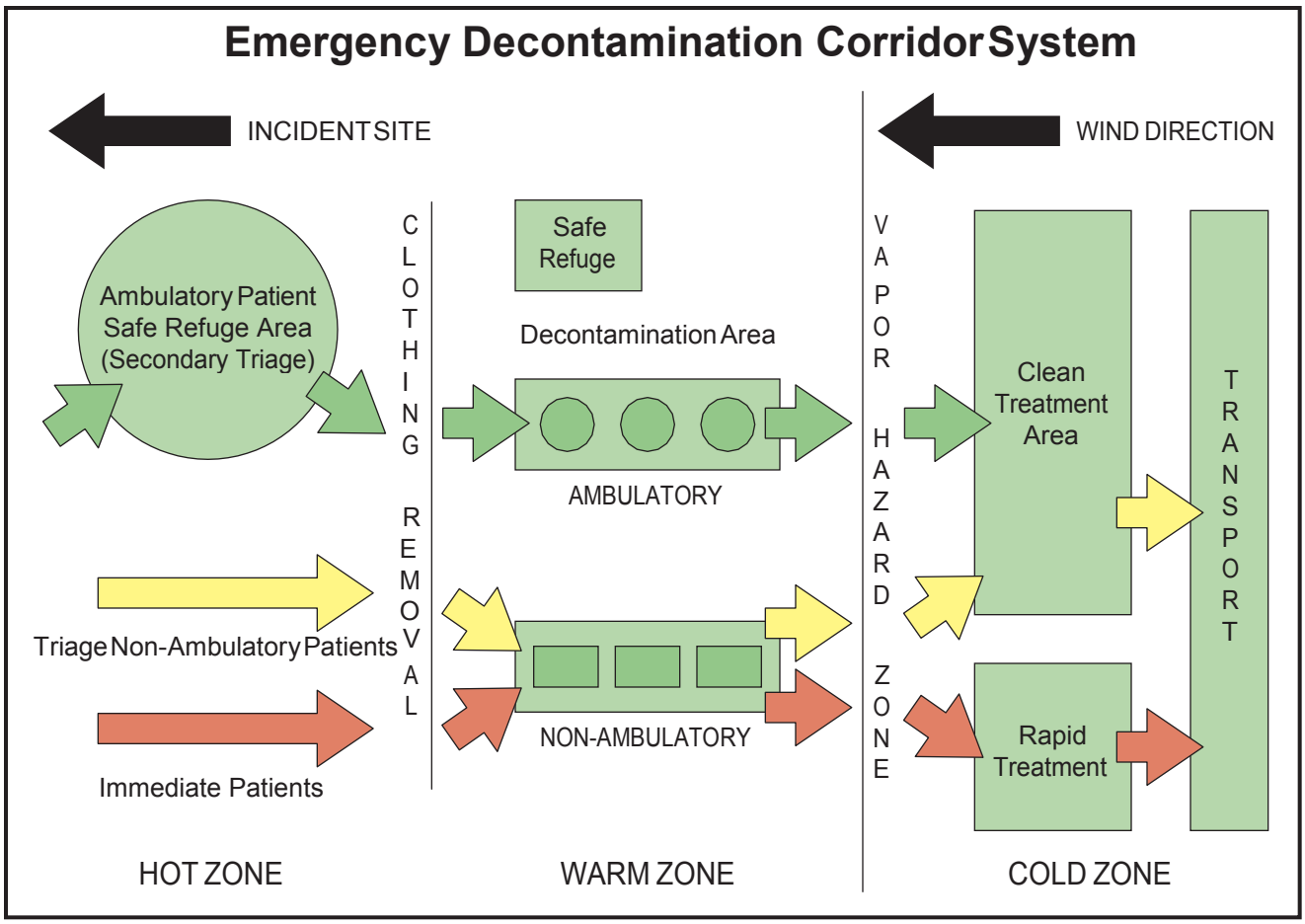
The CRC's boundaries should be marked off with specific access and egress points. Barricade tape, delineators, cones, or natural barriers are effective as markers. A recommended size for the CRC is approximately 20 feet by 75 feet. The important point about size is to ensure that the CRC is large enough for decon personnel to work in comfortably, given the complexity of the specific decon process.

The support zone, or cold zone, should be set up beyond the warm zone in an area that is free of contamination and where emergency operations can be easily directed and supported.

The number of apparent victims from a chemical agent terrorist incident may exceed emergency responders' capabilities to effectively rescue, decontaminate, and treat victims, whether or not they have been exposed to chemical agent. As a result, responders must prioritize victims for receiving decontamination, treatment, and medical evacuation, while providing the greatest benefit for the greatest number.

Whenever large numbers of victims are involved, they should be sorted into ambulatory casualties and non-ambulatory casualties. Ambulatory casualties are victims who are able to understand directions, talk, and walk unassisted. Non-ambulatory casualties are victims who are unconscious, unresponsive, or unable to move unassisted.

California Specialized Training Institute, 2019



Clothing removal

The first step in mass decontamination should be the simple act of clothing removal. It is estimated that up to 80 percent of a chemical exposure can be eliminated by clothing removal alone. Decontamination by removing clothes and flushing or showering with water is the most expedient and the most practical method for mass casualty decontamination. Removing clothing can reduce the degree, severity, and duration of biological and radiological exposure as well.

Generally, it is unnecessary to put victims through the same decon procedures as that for responders in chemical protective clothing. Whether the situation calls for emergency or precautionary decon, ambulatory casualties should be directed to disrobe to the appropriate level and wash themselves (directed self-decontamination).

Directed self-decontamination is important for a number of reasons. First, victims are more likely to do a thorough job decontaminating themselves than responders. (However, it is important to warn victims that it is easy to overlook places where contaminants typically hide, such as in garment folds and modesty areas.) Directed self-decontamination also helps reduce victims' psychological trauma and is sensitive to gender and cultural differences. Moreover, directed self-decontamination saves valuable resources by freeing responders to do other things.

California Specialized Training Institute, 2019

Disrobing and showering meet all the purposes and principles of decontamination. Showering is recommended whenever liquid transfer from clothing to skin is suspected. For a chemical incident, the Occupational Safety and Health Administration (OSHA) recommends that victims take a high-volume, low-pressure shower.

Disrobing should occur before showering for chemical agents. However, based upon the situation, the Incident Commander should make the decision about whether victims should disrobe. Victims should remove their clothing at least down to their undergarments before showering. Victims should be encouraged to remove as much clothing as possible, proceeding from head to toe. Victims unwilling to disrobe should shower in their clothes and then be isolated from those who have been fully decontaminated.

California Specialized Training Institute, 2019

Safety Issues in Terrorism response



Scope

This chapter provides an overview on the general characteristics of CBRNE agents and devices and discusses the outward warning signs that such agents and devices may have been deployed in a terrorist attack.



Terminal Learning Objective (TLO)

At the end of instruction for Chapter 10, participants will be able to plan a safe hazardous materials response that is consistent with the emergency response plan and the organization at a terrorist incident, ensuring the protection of response personnel from physical, environmental, and chemical hazards and exposures.



Enabling Learning Objectives (ELOs)

This chapter's enabling learning objectives are to ensure participants will be able to:

1. Explain why every terrorist incident that involves deployment of a chemical, biological, radiological/nuclear, or explosive (CBRNE) agent is a hazardous materials incident.
2. Describe general clues first responders should be alert to that might indicate a terrorist incident.
3. Identify specific clues that indicate a CBRNE agent may have been used in a terrorist attack.

Supporting Materials/resource List

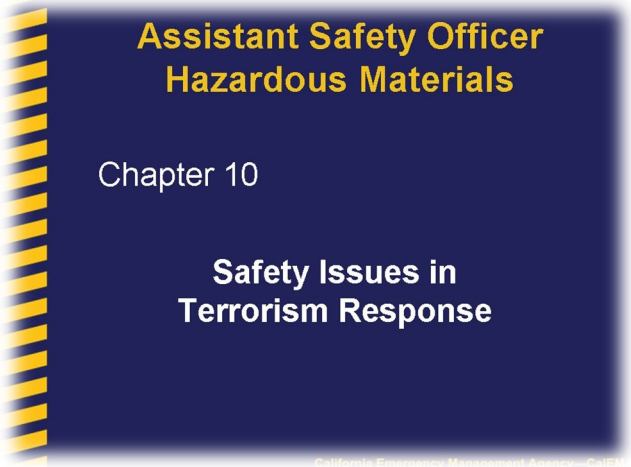
See Supporting Materials/Resource List section starting on page 425.



Practical Exercises

Note: No exercises are scheduled for this chapter.

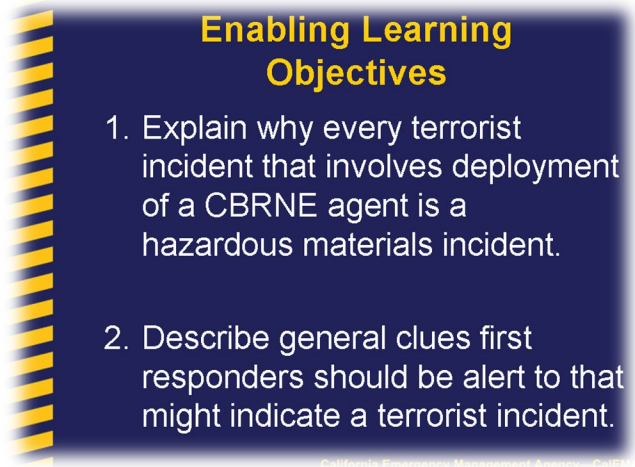
California Specialized Training Institute, 2019



Slide 10.1

The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

- (Res.B.2 5.1.1) Identify hazardous materials and extent/scope of the incident.
- (Res.B.2 5.1.1.5) Assess hazardous materials release situation.
- (Res.B.2 5.4) Ensure the safety of all on-scene responders.
- (Res.B.2 5.4.4) Coordinate rescue efforts with law enforcement to ensure safety of rescuers while law enforcement secures incident site.



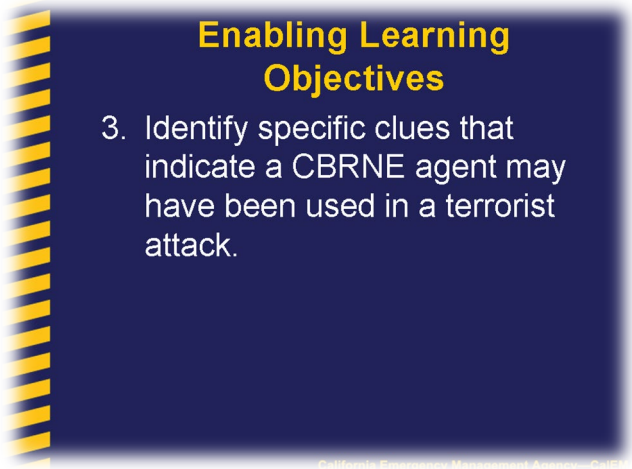
Slide 10.2

The goal (terminal learning objective) of this chapter is to ensure that participants will be able to plan a safe hazardous materials response that is consistent with the emergency response plan and the organization at a terrorist incident, ensuring the protection of response personnel from physical, environmental, chemical hazards and exposures, mechanical, and psychological.

This chapter's enabling learning objectives are to ensure participants will be able to:

1. Explain why every terrorist incident that involves deployment of a chemical, biological, radiological/nuclear, or explosive (CBRNE) agent is a hazardous materials incident.
2. Describe general clues first responders should be alert to that might indicate a terrorist incident.

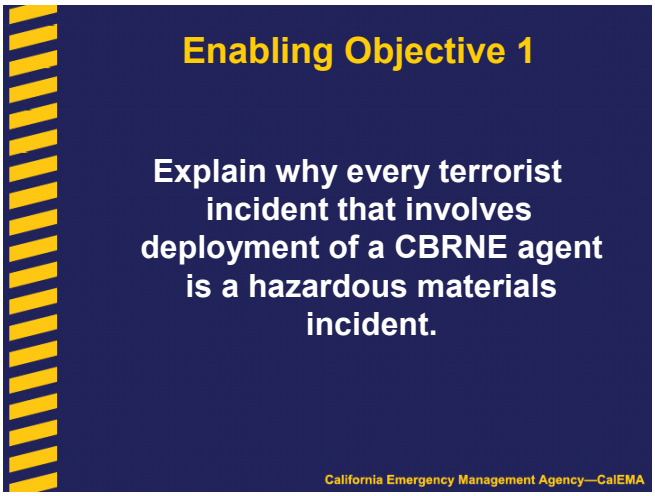
California Specialized Training Institute, 2019



Slide 10.3

This chapter's enabling learning objectives will also ensure participants will be able to:

3. Identify specific clues that indicate a CBRNE agent may have been used in a terrorist attack.



Slide 10.4

California Specialized Training Institute, 2019



Slide 10.5

In terms of response, a hazardous materials incident and a terrorist event are virtually the same. *Every* act of terrorism that involves the deployment of a chemical, biological, radiological/nuclear, or explosive agent is a hazardous materials incident.

The real difference between a hazardous materials incident and a terrorist event is intent. Most hazardous materials incidents are accidents. Terrorist acts, on the other hand, are deliberate. The location of the incident, therefore, becomes a crime scene. As a result, it is important for responders to preserve all evidence, where possible.

However, one difference between the two is that the chemical or biological agents in a terrorist incident usually may be more toxic than those in industrial releases.

Another difference is that, during a standard hazmat incident, responders will be able to rely on Department of Transportation (DOT) placards, labels, and shipping papers, which are mandated by various federal laws, to help identify the hazardous material. These warning signs of hazardous materials may not be present at a terrorist incident.

In general, by the time the ASO-HazMat arrives at the scene, clues will already have been gathered to indicate a terrorist attack.



Slide 10.6

Has anyone responded to an incident in which terrorism was the suspected cause?

What were the circumstances?

Were there any safety issues?

California Specialized Training Institute, 2019



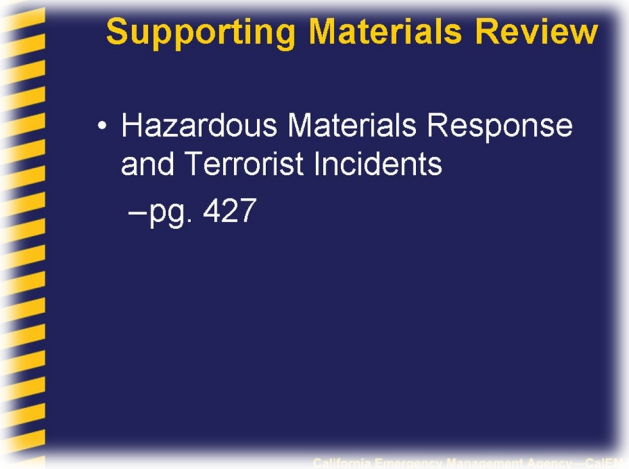
Slide 10.7

Domestic terrorists, motivated by a number of political or social agendas (such as white supremacy, animal rights, eco-terrorism, anarchy, anti-abortion, and the militia movement) continue to use violence and criminal activity to further their agendas.

Domestic religious terrorism typically occurs at particularly susceptible times, such as severe economic downturns, the advent of new or modified technologies, and social upheavals. Under these conditions, a fringe sect with a charismatic leader and access to sufficient resources may become a very powerful threat to society. The existence of such groups may not be known until they act.

Violence on the part of white supremacists remains an ongoing threat to government targets, as well as to Jewish and non-white ethnic groups.

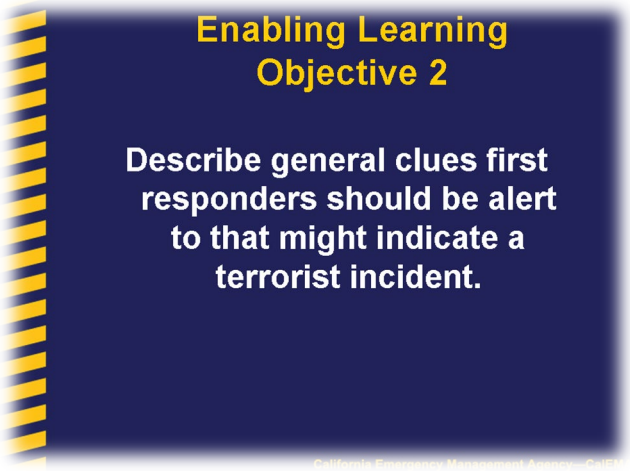
Animal rights and environmental extremists use a variety of tactics against their targets (such as logging interests and medical researchers), including arson, sabotage/vandalism, theft of research animals, and bombings.



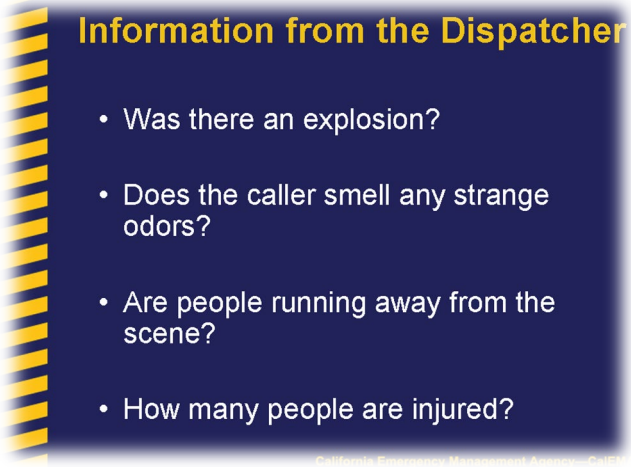
Slide 10.8

Review the listed supporting materials in the participant guide, page 427.

California Specialized Training Institute, 2019



Slide 10.9



Slide 10.10

Many terrorist incidents are initially reported and dispatched to responders as everyday events, such as an unconscious person or a fire. Once responders arrive at the incident, it often becomes very difficult to differentiate between a normal emergency response and a terrorist incident.

The dispatcher or call-taker can provide the first clue as to the possibility that a terrorist incident has occurred.

The dispatcher or call taker may be able to answer questions about the incident, such as:

- Was there an explosion?
- Does the caller smell any strange odors?
- Are people running away from the scene?
- Is there panic and chaos?
- Are chemicals involved?
- How many people are injured?

California Specialized Training Institute, 2019



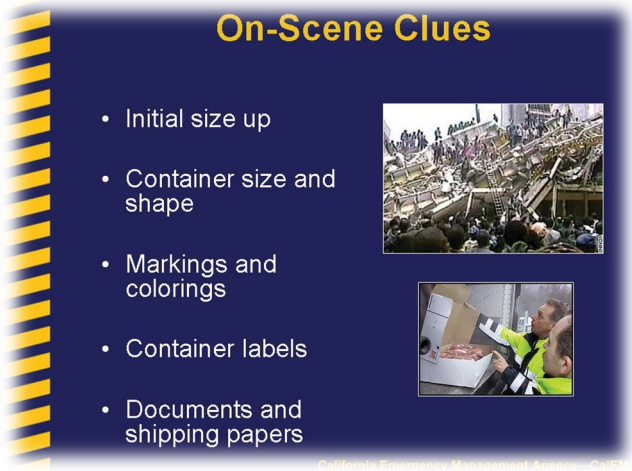
Slide 10.11

Almost any facility that symbolizes a terrorist cause can be a target. But some locations, or occupancies, are "preferred" terrorist targets, such as:

- Government agencies and offices (such as the Federal Bureau of Investigation [FBI] or the Internal Revenue Service [IRS])
- Military and industrial complexes
- Mass transit centers
- Recreation facilities
- Family planning/abortion clinics
- Religious centers
- Animal research labs
- Critical systems and infrastructure (such as communications, banking systems, nuclear power plants, railway lines, and drinking water supplies)

Large crowds, regardless of the release location, are another potential terrorist target. Large crowds may ensure a high number of casualties, panic, and coverage by the news media.

Large quantities of hazardous chemicals can be found at many commercial and industrial facilities, such as trucking facilities that have placarded trucks and petrochemical farms.

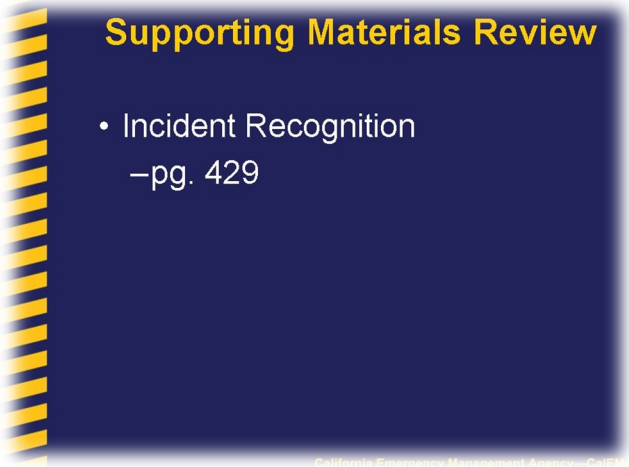


Slide 10.12

During initial size up, an explosion is one of the most obvious clues of a terrorist incident. First responders should be alert to any labels on containers or vehicle placards that might indicate the presence of hazardous materials.

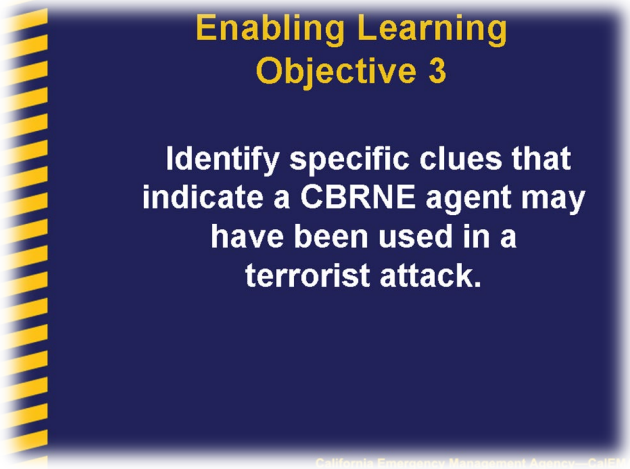
Explosives are the weapon of choice for terrorists. Seventy percent of all terrorist attacks involve explosives. Be on the alert for additional devices.

California Specialized Training Institute, 2019



Slide 10.13

Review the listed supporting materials in the participant guide, page 429.



Slide 10.14

California Specialized Training Institute, 2019

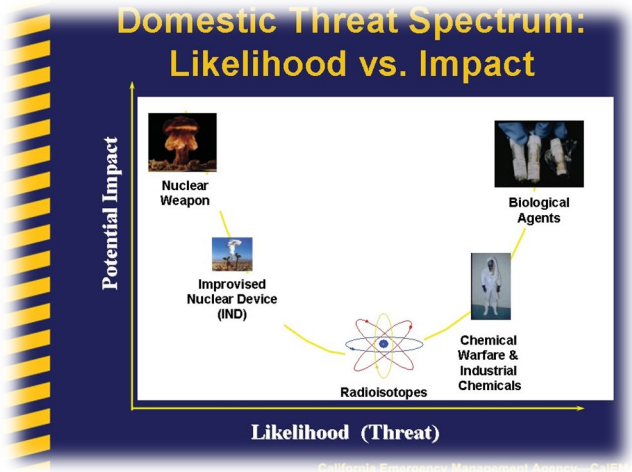


Slide 10.15

Terrorists potentially have a wide range of available weapons, from very simple devices to exceedingly complex ones. The types of weapons that might be used in a terrorist attack include chemical, biological, nuclear, radiological, and explosive devices.

Collectively, these methods of mass destruction are known as CBRNE.

Each type of weapon carries different hazards for emergency responders. It is of vital importance for emergency responders to be aware of the warning signs each type of weapon presents.

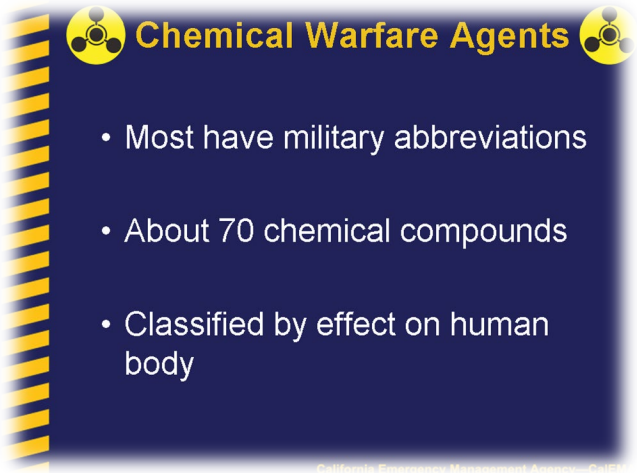


Slide 10.16

Although many different methods and weapons exist, some are easy to obtain and deploy, while others are almost impossible for a terrorist to obtain. For example, it would be very difficult for a terrorist group to get an actual nuclear weapon. They might be able to obtain radioactive material, but that is not the same as the actual weapon.

This graphic ranks the probability such weapons might be deployed and their potential for devastation. Nuclear weapons are shown as being the most devastating but most difficult to obtain. In contrast, explosives are the least devastating, but are the easiest to obtain and turn into weapons.

California Specialized Training Institute, 2019



Slide 10.17

Manufactured chemicals that are used to incapacitate, harm, or kill people are considered chemical warfare agents. About 70 different chemicals have been used or stockpiled as chemical warfare agents during the 20th century and the 21st century. These agents may be in liquid, gas, or solid form. Liquid agents are generally designed to evaporate quickly; such liquids are said to be *volatile or have a high vapor pressure.* Many chemical warfare agents are made volatile so they can be dispersed over a large region quickly.

The use of chemical warfare agents is no longer the exclusive purview of the military. They are cheaper and easier to manufacture and deliver than nuclear or biological weapons. This poses a formidable challenge for first responders worldwide.

For a chemical warfare agent to cause harm, it must come in contact with the skin or mucous membranes or be inhaled or ingested. The activity of the chemical agent depends on its concentration. Below a certain level of exposure, the agent won't kill; below a certain level of exposure, the agent won't cause harm.

Chemical warfare agents are usually classified into six broad categories, according to their effect on the human body.



Slide 10.18

Nerve agents are the most toxic and rapidly acting of the known chemical warfare agents. They are similar to pesticides (insect killers) and prevent the nervous system from working properly.

Blister agents, or vesicants, are chemicals that severely blister the eyes, respiratory tract, and skin on contact.

Choking agents are chemicals that cause severe irritation or swelling of the respiratory tract (lining of the nose, throat, and lungs).

Blood agents are poisons that affect the body by being absorbed into the blood.

Irritating agents are designed to temporarily debilitate, rather than kill, victims. These highly irritating agents are normally used by law enforcement for crowd control or by individuals for protection (for example, mace).

Incapacitating agents are drugs that make people unable to think clearly or that cause an altered state of consciousness (possibly unconsciousness).

Each of these agents offers different outward signs as to its presence or use.

California Specialized Training Institute, 2019



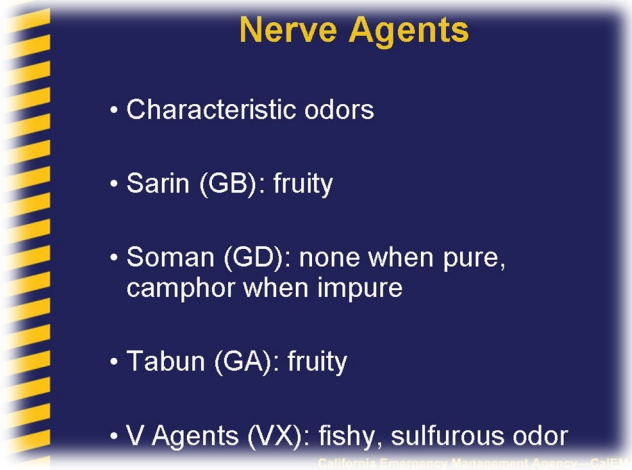
Slide 10.19

There are several general warning signs, or clues, the ASO-HazMat—and all on-scene responders—should be alert to that may indicate the use of chemical agents.

In particular, explosions that dispense liquids, mist, or gases, or radioactive materials that seem only to destroy a package or bomb device are warning signs that a chemical agent may have been used as a terrorist weapon.

In addition, responders should be alert to any unscheduled or unusual aerial sprays with crop dusters, especially in a densely populated area, and the presence of abandoned spray devices.

Victims who exhibit skin irritation, respiratory distress, and gastrointestinal upset also indicate possible exposure to a chemical agent.



Slide 10.20

Most of the literature on nerve agents describes them as colorless and odorless. In fact, nerve agents actually have a characteristic odor. Sarin, for example, typically smells fruity. However, contaminants may mask the nerve agent's odor. As an example, the sarin used in the Tokyo subway attacks was described as foul smelling.

It is important for responders to know which odors are associated with specific nerve agents. The intent is not to identify a specific chemical agent. Instead, the intent is to use this knowledge as a warning sign that chemical agents may be present, especially if victims report smelling unusual odors.

The initials, for example, GB, indicate the military abbreviation for the specific nerve agent.

California Specialized Training Institute, 2019



Slide 10.21

The rapid onset, usually within minutes, of similar symptoms in a large group of people generally is the most significant outward warning sign that a nerve agent has been released. Because nerve agents are so lethal, mass fatalities without other signs of trauma are likely to occur.

Except for dermal exposure, pinpoint pupils (miosis) are the best symptomatic indication of the use of a nerve agent. Other clues that a nerve agent may have been released include:

- Unusual numbers of dead animals, fish, and birds
- Lack of insect life
- Definite pattern of casualties
- Civilian panic in potential target area



Slide 10.22

Aum Shinrikyo's sarin attacks in the Tokyo subway (1995) and the town of Matsumoto (1994) marked the first times a non-state actor is known to have developed and successfully used a chemical weapon, or any other weapon of mass destruction, in a terrorist attack.

The firefighters who were injured in the Tokyo incident were not wearing respiratory protection.

California Specialized Training Institute, 2019



Slide 10.23

The mustard gases of World War I are probably the most familiar blister agents. Blister agents are heavy, oily liquids.

These agents are extremely toxic: A few drops of mustard on the skin can cause severe injury; three grams absorbed through the skin can be fatal.



Slide 10.24

In a pure state, blister agents are colorless and nearly odorless. In an impure state, they are dark-colored and have a strong odor that resembles mustard, onions, or garlic.

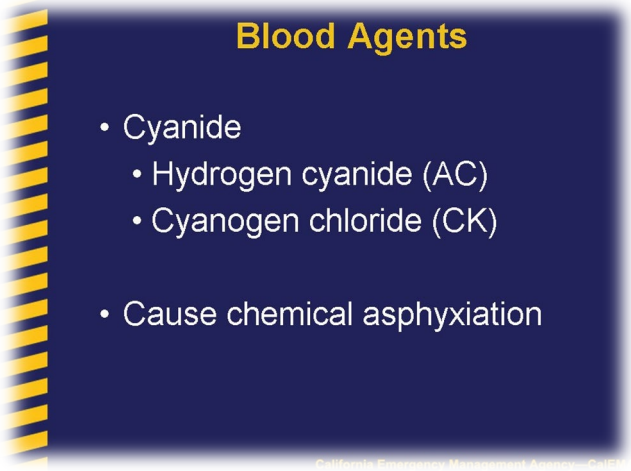
Typically, symptoms take from two to twenty-four hours to manifest.

First symptoms may include red, itchy, or painful skin, followed by blisters. Later symptoms may include pain or swelling in the eyes and lungs, tears in the eyes, and trouble breathing.

Other warning signs a blister agent may have been used are those for chemical agents in general:

- Explosions that dispense liquids, mist, or gas
- Explosions that seem only to destroy a package or bomb device
- Unscheduled and unusual aerial sprays
- Abandoned spray devices

California Specialized Training Institute, 2019



Slide 10.25

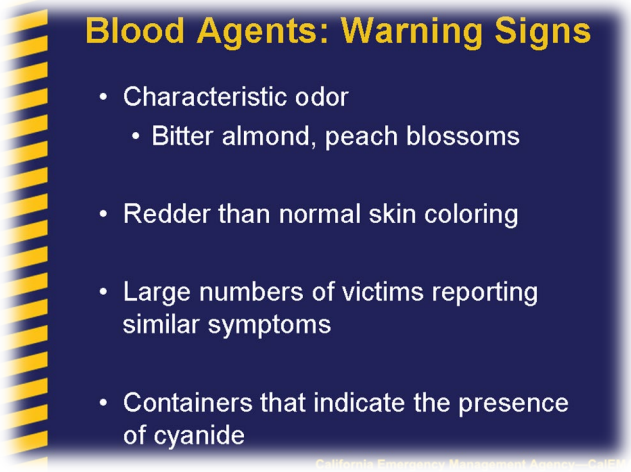
Cyanide compounds are the most familiar blood agents.

Blood agents produce casualties by interfering with the blood's ability to transfer oxygen to the cells, which leads to death by chemical asphyxiation.

Although commonly thought to be a very deadly chemical, cyanide causes almost no effect after a brief exposure to low concentrations.

In low concentrations (ppm), cyanide may produce nausea and dizziness, coupled with weakness and anxiety. However, symptoms typically regress after the victim has been exposed to fresh air for a while.

Large concentrations of cyanide are required to produce a loss of consciousness or death.

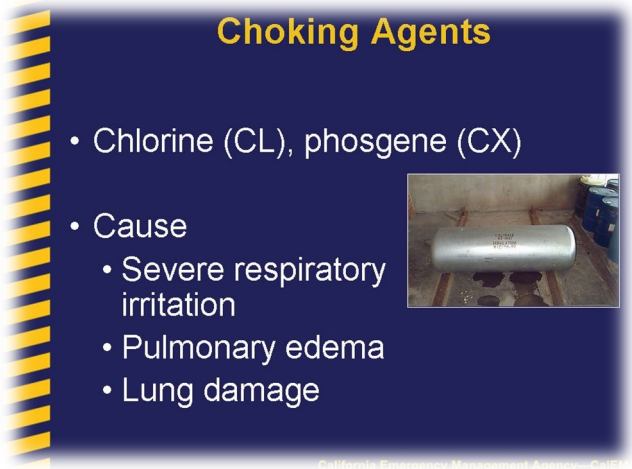


Slide 10.26

Typical signs that a blood agent may have been released include:

- Victims reporting smelling odors of bitter almond or peach blossoms
- Victims with redder than normal-looking skin coloring
- Large numbers of casualties displaying common symptoms
- Containers with markings that indicate the presence of cyanide

California Specialized Training Institute, 2019

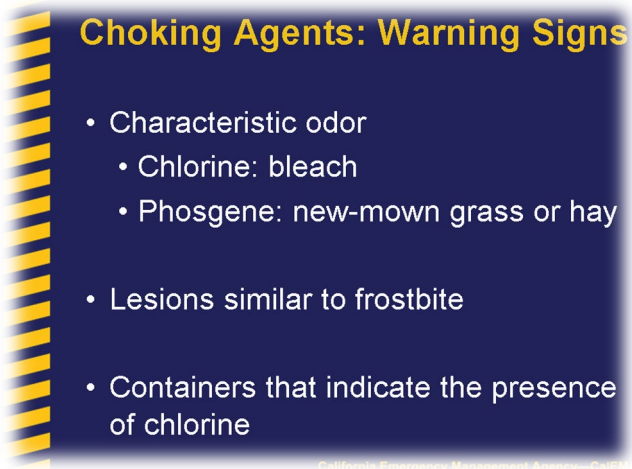


Slide 10.27

The two most common choking agents are chlorine and phosgene. Used in World War I, chlorine and phosgene are among the first agents used in chemical warfare. Choking agents produce casualties by causing severe irritation to the respiratory system and eyes.

Chlorine damages the lungs and causes pulmonary edema (fluid in the lungs). The first symptom of pulmonary edema usually is shortness of breath. Basically, the lungs fill up with blood plasma, preventing air from entering, and the victim drowns. Since the victim cannot get enough oxygen, this form of suffocation is sometimes referred to as "dry-land drowning."

Phosgene is no longer used by the military. It is not considered a skin absorption danger, however it may irritate the skin.



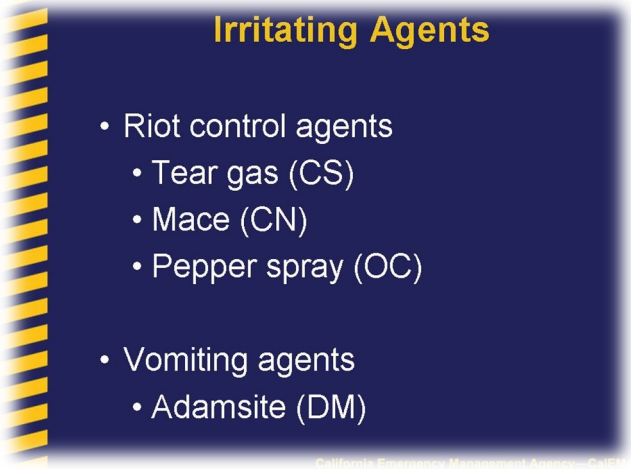
Slide 10.28

Chlorine has a very distinct smell (bleach), while phosgene generally smells like new-mown grass or hay. Responders should be aware that, for phosgene, the concentration for odor recognition is very close to the concentration that will cause lung damage.

Other general warning signs a choking agent may have been used include:

- Location (occupancy)
- Container markings
- Victims' physical symptoms

California Specialized Training Institute, 2019



Slide 10.29

These chemical agents include:

- Riot control, or irritating, agents (such as tear gas, mace, and pepper spray)
- Vomiting agents (such as Adamsite)



Slide 10.30

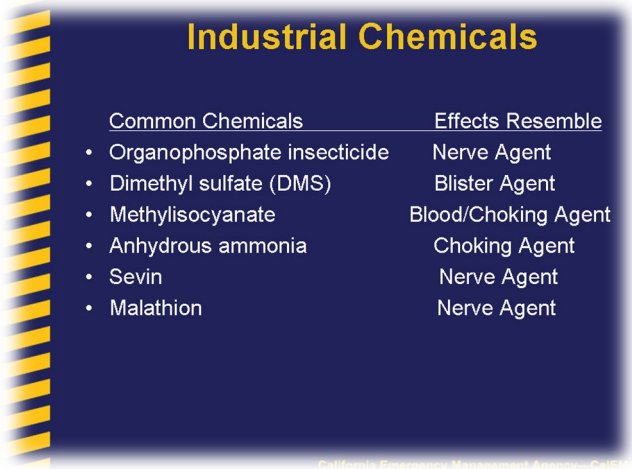
These nonlethal agents cause victims to have severe psychological disturbances, such as decreased levels of concentration, short attention spans, illusions, hallucinations, and impaired memory.

The onset of incapacitation is dose-dependent. It might occur as early as one hour after exposure and continue up to 48 hours.

BZ is odorless and non-irritating. Because its clinical effects are not seen for between 30 minutes to 24 hours, victims may not even know they have been exposed to the agent.

Agent-15 is an alleged Iraqi incapacitating agent that is likely to be chemically either identical to BZ or closely related to it.

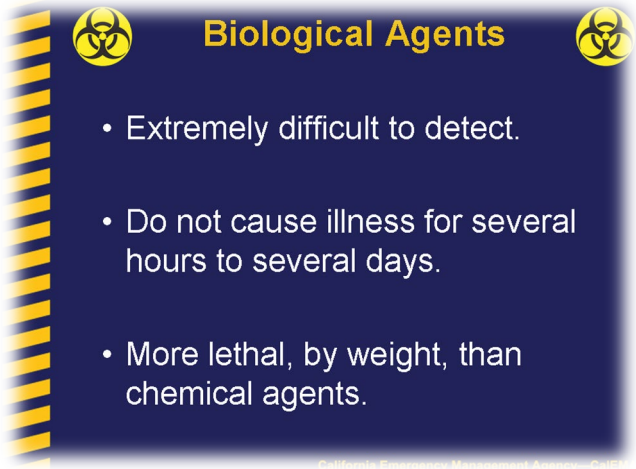
California Specialized Training Institute, 2019



Slide 10.31

Many chemical compounds commonly used for industrial purposes are hazardous.

They pose the same threats to emergency responders as nerve, blister, blood, and choking agents.



Slide 10.32

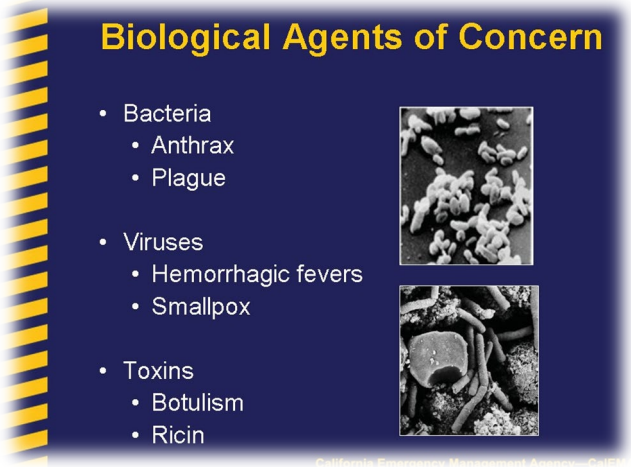
A bioterrorism attack is the deliberate release of viruses, bacteria, fungi, and rickettsia may cause illness or death. These agents are typically found in nature, but it is possible that they could be changed to increase their ability to cause disease, make them resistant to current medicines, or increase their ability to be spread into the environment.

Terrorists may use biological agents because they can be extremely difficult to detect and do not cause illness for several hours to several days. In addition, biological agents are invisible to the human senses. They cannot be seen, tasted, heard, felt, or smelled.

Biological agents can be spread through the air, through water, or in food. Some bioterrorism agents, such as the smallpox virus, can be spread from person to person and some, such as anthrax, cannot.

By weight, biological agents are more toxic than chemical agents. For example, VX is considered the most toxic nerve agent. The biological toxin botulinum is 5,000 to 10,000 times more toxic by weight than VX.

California Specialized Training Institute, 2019



Slide 10.33

Anthrax, hemorrhagic fevers, plague, smallpox, and tularemia (rabbit fever) may be probable biological weapons. These pathogens pose a risk to national security because they:

- Can be easily disseminated or transmitted from person to person
- Result in high mortality rates and have the potential for major public health impact
- Might cause public panic and social disruption
- Require special action for public health preparedness

Toxins are poisonous substances produced by living things. Many toxins are extremely lethal, and small quantities can kill very large numbers of people. In many ways, a toxin attack is more like a chemical attack than a biological one. Some possible toxin weapons include ricin, botulism, and aflatoxin.



Slide 10.34

The first indication of a bioterrorist incident will probably be a significant increase in 9-1-1 calls and EMS responses for people who are experiencing flu-like symptoms. An on-scene sign that a bioterrorist attack might have occurred is an abandoned dissemination device, such as a garden sprayer, next to a building's heating, ventilation, and air conditioning system. Terrorists might also provide a verbal or written threat about the attack.

Vectors are another type of dissemination device. Vectors are often used to disseminate living biological agents. A vector could be a letter or package, insects or animals, and contaminated clothing, food, or water.

In terms of response, the goal is to very quickly identify the event as bioterrorism in order to minimize the impact. The key to early identification is being able to recognize that you are not dealing with other illnesses, such as the flu, that have been seen before.

Providing timely and appropriate intervention is one of the most important healthcare issues in dealing with bioterrorism. For example, treating for anthrax exposure within 24 hours yields a 90 percent survival rate. However, once symptoms have developed, the fatality rate is almost 90 percent, despite treatment.

California Specialized Training Institute, 2019



Slide 10.35

In 1984, two members of a cult led by Bhagwan Shree Rajneesh cultivated salmonella bacteria. They used the salmonella to contaminate restaurant salad bars. The motivation for the attack was to influence a local Oregon election.

A total of 751 people became ill and 45 were hospitalized. There were no fatalities.



Slide 10.36

Of the five types of terrorist weapons described by the CBRNE acronym, a nuclear weapon is the least likely a terrorist organization would obtain and use.

However, there is the potential for terrorists to obtain radiological materials and use those materials in a radiological dispersal device (RDD), or "dirty bomb." The detonation of such a device would cause widespread contamination and could also cause widespread panic.

Radiation cannot be detected by the human senses. It can only be detected with specific detection and monitoring equipment.

The outward warning signs for nuclear terrorism may be as subtle as those for biological incidents. If a dirty bomb is used, there would be an explosion. If containers are involved, they may be marked with DOT labels. Similarly, if vehicles are involved, they may be placarded.

California Specialized Training Institute, 2019

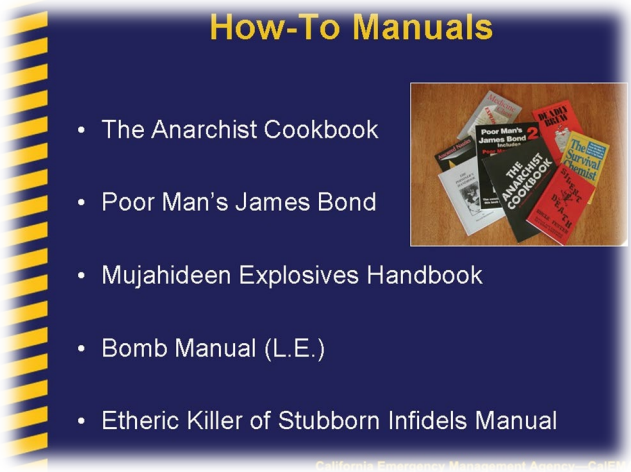


Slide 10.37

Terrorists have a number of devices at their disposal for setting off explosions—vehicle bombs, pipe bombs, satchel devices, and more sophisticated mines and projectiles, to name a few. Explosives can be used to disperse other CBRNE materials.

Responders should be alert to the possibility of an ambush. In this scenario, the bomber lures first responders to a scene by detonating a small device to create an emergency incident. When the incoming police, fire, and EMS units arrive on scene, they become victims of a secondary device intended for a larger crowd.

In addition to trauma, the medical conditions most frequently attributed to explosions are ruptured eardrums and "blast lung." Blast lung is caused when the overpressure from the explosion ruptures the alveoli and capillaries in the lungs, causing the victim to cough up frothy blood from the mouth and nose.



Slide 10.38

Readily available underground books and Web sites concerning bomb-making easily provide terrorists with directions for making bombs that can cause tremendous damage.

Books such as *The Anarchist Cookbook* and the *Poor Man's James Bond*, for example, have consistently caused problems for first responders over the years.

However, because many of the recipes provided in these how-to resources are wrong, many of these devices inadvertently explode.

California Specialized Training Institute, 2019



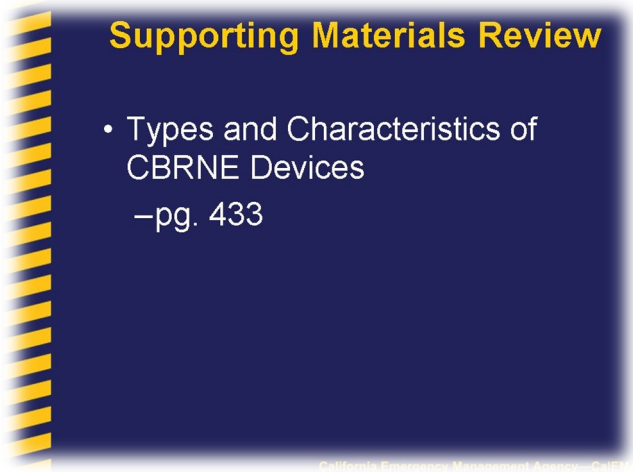
Slide 10.39

Location or occupancy may be an indication of an explosives event. Residential properties are the target of choice for terrorists, followed by commercial occupancies, vehicles, and schools.

The day and month can also provide first responders with clues as to the nature of the incident. More bombings take place during the months of July, August, and September than any other part of the year. The most active day of the week is Monday.

Another outward warning sign is vehicle occupants fleeing on foot or taking cover. Truck bombs are manufactured at a remote location, and then driven to the target.

Responders should also be aware of clues such as shock waves and loud noises, blast damage, and evidence of the actual device.



Slide 10.40

Review the listed supporting materials in the participant guide, page 433.

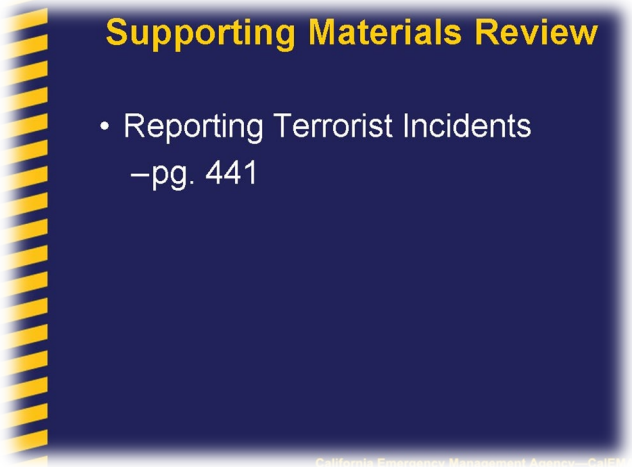


Slide 10.41

Emergency response agencies typically have a standard operating procedure that outlines who gets notified for each specific type of emergency. It is important for the ASO-HazMat to know who should receive information regarding a terrorist incident.

The easiest and safest way to report a terrorist incident is by telephone, if telephones are still working. During incidents involving explosives, cellular phones may not work.

First-due emergency units should restrict or discontinue communication via radio, cellular, and mobile data terminal within 450 feet of any explosives. Radio transmitters can create a field of electric energy sufficient to trigger electric blasting caps. Low-frequency transmissions are more dangerous.



Slide 10.42

Review the listed supporting materials in the participant guide, page 441.

California Specialized Training Institute, 2019



Slide 10.43

When responding to incidents involving known CBRNE agents or incidents involving *unknown materials*, the potential for exposure to explosive, radiological, biological, incendiary, or chemical hazards is a very real threat to the health and safety of personnel.

The responsibilities of the ASO-HazMat during acts of terrorism are no different than during hazardous materials incidents. However, the consequences of the ASO-HazMat's actions may be profoundly different.

As a result, the ASO-HazMat must be sure of the warning signs of terrorism, follow agency protocols, inform other responders of the hazards, and take appropriate actions.

California Specialized Training Institute, 2019

Chapter 10



Supporting Materials/ Resource List

Hazardous Materials response and Terrorist Incidents

What is the difference between a hazardous materials incident and a terrorist event? In terms of response, they are virtually the same. *Every* act of terrorism that involves the deployment of a chemical, biological, radiological/nuclear, or explosive agent is a hazardous materials incident. The real difference is intent. Most hazardous materials incidents are accidents. Terrorist acts, on the other hand, are deliberate. The location of the incident, therefore, becomes a federal crime scene. As a result, it is important for responders to preserve all evidence, where possible.

In responding to typical incidents involving hazardous materials, hazmat teams take a methodical approach. This approach is based on standard operating procedures, policies, and training. However, when it comes to dealing with a terrorist incident, this standard approach may be insufficient in terms of personnel or equipment. For example, a terrorist incident may result in mass casualties or in the need for respiratory protection (or a higher level of protective clothing) to ensure the safety of responders working in the control zones.

Responding to incidents in which weapons of mass destruction (WMD) are known to have been used, or in which the materials are unknown, carries the potential for exposure to explosive, radiological, biological, incendiary, or chemical hazards. Even so, the responsibilities of the Assistant Safety Officer-Hazardous Materials (ASO-HazMat) during WMD incidents are no different than those during hazardous materials incidents. However, the consequences of the ASO-HazMat's actions may be profoundly different.

As a result, the ASO-HazMat must be alert to the warning signs of terrorism, follow agency protocols, inform other responders of the hazards, and take appropriate actions. This chapter will discuss some of the critical issues in terrorism response that the ASO-HazMat must be aware of in order to protect hazmat responder health and safety.

California Specialized Training Institute, 2019

Incident recognition

By the time the Assistant Safety Officer-Hazardous Materials (ASO-HazMat) arrives on the scene, the incident may already be identified as an act of terrorism. Even so, it is important for the ASO-HazMat to take the time for a review of incident identification for weapons of mass destruction (WMD). Developing skills for basic recognition of WMD has been part of the hazardous materials training curriculum for many years.

Types of Incidents

Terrorists have many different methods and weapons for disruption and destruction at their disposal. Some are easy for a terrorist to obtain and deploy; others are almost impossible to obtain. For example, it would be very difficult for a terrorist to get an actual nuclear weapon. Terrorists might be able to obtain radioactive material, but that is not the same thing as constructing an actual weapon. On the other hand, incendiary material is very easy to obtain and convert into a weapon.

The acronym CBRNE is a convenient tool to remember the types of weapons terrorists might use. CBRNE stands for chemical, biological, radiological dispersal device, nuclear weapon, and explosives. The majority of terrorist incidents involve explosives.

Some terrorist incidents turn out to be hoaxes. These hoaxes may cause just as much fear as the real incident. Hoaxes can also accomplish one of the main goals of the terrorist, which is to cause targeted or widespread anxiety, fear, and uncertainty. Hoaxes also further other terrorist goals, such as creating confusion, disruption, and loss of confidence in government agencies and authorities.

Clues

Every incident provides clues that will help the hazardous materials responder identify the possibility that an act of terrorism has caused the emergency. The ASO-HazMat—and all responders—must be aware of and use these clues in the course of responding safely and effectively to every incident. These clues were introduced in the "Hazardous Materials for First Responders" awareness course. Of course, all of these clues will not necessarily be present at any given terrorist incident.

The clues an ASO-HazMat should analyze to help determine if a hazardous materials incident is the result of a terrorist act include:

- Information from the dispatcher
- Location (or occupancy)
- Initial size up
- Container size and shape
- Container labels
- Markings and colors
- Identification numbers

California Specialized Training Institute, 2019

- Documents and shipping papers
- Human senses

Other clues to take into consideration include:

- Unusual numbers of people dying in an area, or from strange causes
- Unusual numbers of sick or dying animals, birds, or fish
- Lack of insect life where it should be seen
- Unusual numbers of people in an area complaining of blisters/rashes, nausea, disorientation, difficulty in breathing, convulsions, localized sweating, conjunctivitis (reddening of the eyes), erythema (reddening of the skin), or any irregular symptoms
- Strange colored smoke coming from the area of a detonation
- Explosions that seem to do very little damage, release an unusual amount of smoke, or leave droplets of liquid in the area or fragments covered with liquid or droplets
- Unusual appearance of any liquid droplets, particularly where there should be none
- Abandoned aerosol sprayers in the area of sick people
- People reporting unusual odors or tastes
- Unexplained mists or hazes in urban area
- Sudden or unexplained appearance of low-lying clouds
- Unidentified, low-flying aircraft—particularly crop dusters—over a populated area

Information from the Dispatcher

The dispatcher or call-taker can provide the first clue as to the possibility that a terrorist incident has occurred. The caller may have information concerning incident conditions, such as:

- Are chemicals involved?
- Was there an explosion?
- How many people were injured?
- Does the caller smell any strange odors?
- Are a lot of panicked people running away from the scene?

Of course, an explosion is one of the most obvious clues that a terrorist incident has occurred. However, when firefighters hear there has been an explosion, they generally think about a gas leak or a machinery malfunction involving flammable gasses as the cause of the explosion. However, responders should keep this in mind: **Explosives are the number one weapon of choice being used by terrorist. Seventy percent of all terrorist attacks involve explosives.**

California Specialized Training Institute, 2019

Unfortunately, many terrorist incidents are initially reported and dispatched to responders as something else, such as an unconscious person or a fire. Once responders arrive at the incident, it often becomes very difficult to differentiate between a normal emergency response and a terrorist incident.

Location or Occupancy

Particular buildings, such as offices for the Federal Bureau of Investigation (FBI) or the Internal Revenue Service (IRS), as well as military installations are considered likely targets of terrorism. Almost any facility that symbolizes a terrorist cause can be a target. Some of these buildings and facilities include:

- Government agencies and offices
- Industrial complexes
- Mass transit centers
- Recreation facilities
- Medical research laboratories
- Family planning/abortion clinics
- Religious centers

Targets of special interest to terrorists for attack include animal research labs, government offices, abortion clinics, and religious sites.

Large Crowds

Large crowds, regardless of the release location, are another potential terrorist target. Terrorist acts that involve large numbers of people may ensure a high number of significant casualties, panic, and coverage by the news media. Large crowds typically are found at popular sporting events or any other widely publicized event.

Critical Systems and Infrastructure

Critical systems and infrastructure include targets such as electric power grids, dams, bridges, and drinking water supplies.

Facilities with Significant Hazards

Large quantities of hazardous chemicals can be found at many commercial and industrial facilities. Trucking facilities that have placarded trucks or petro-chemical farms are examples of such facilities. These facilities are potential terrorist targets.

California Specialized Training Institute, 2019

Types and Characteristics of CBrnE devices

This section will discuss the most common substances a terrorist might use in an attack and some of the warning signs that indicate a CBRNE device might have been deployed. An ASO-HazMat should have knowledge of CBRNE agents.

Chemical Agents

Chemical agents have been used as weapons throughout recent human history, especially on the battlefield. However, the first large-scale use of chemical weapons occurred during World War I, when Germany released hundreds of tons of chlorine gas on Allied forces in Belgium, killing an estimated 5,000 troops. As the war continued, the chemical agents changed from chlorine gas to mustard agents, and all sides began to use chemicals as weapons. More recently, United Nations inspections revealed that Iraq had used chemical weapons against Iran and Iraqi Kurds in the 1980s.

The use of chemical warfare agents is no longer the exclusive purview of the military. Chemical warfare agents are cheaper and easier to manufacture and deliver than nuclear or biological weapons. This poses a formidable challenge for first responder's worldwide. The use of sarin in 1994 and 1995 by Aum Shinrikyo, a Japanese religious cult, is perhaps the most high-profile case of chemical weapons attacks on civilians.

Chemical warfare agents are usually classified into six broad categories, according to their effect on the human body:

- Nerve agents (for example, sarin, soman, tabun, and VX)
- Blister agents (for example, mustard agents, lewisite, and phosgene oxime)
- Blood agents (for example, hydrogen cyanide and cyanogen chloride)
- Choking agents/pulmonary agents (for example, chlorine and phosgene)
- Irritating agents/riot-control agents (for example, mace, tear gas, and pepper spray)
- Incapacitating agents (for example, BZ and Agent-15)

Nerve Agents

Nerve agents are the most toxic and rapidly acting of the known chemical warfare agents. In fact, the most significant sign a nerve agent has been released is the rapid onset, within minutes, of similar symptoms in a large group of people. Except for dermal exposure, pinpoint pupils (miosis) are the best symptomatic indication that a nerve agent has been used. Because nerve agents are so lethal, mass fatalities without other signs of trauma also may occur.

Nerve agents are similar to pesticides (insect killers) called organophosphates in terms of how they work and what kinds of harmful effects they cause. However, nerve agents are much more potent than organophosphate pesticides. Exposure to these agents causes a disruption of nerve impulse transmissions by reacting with the enzyme acetylcholinesterase. Exposure to even minute quantities may be rapidly fatal.

California Specialized Training Institute, 2019

Nerve agents are often described as odorless and colorless. This is not true. Each agent has a characteristic odor. For example, sarin (also known as GB) typically has a fruity odor, as does the nerve agent tabun (also known as GA). Soman (also known as GD) has no odor when pure, but smells like camphor when impure. VX has a fishy sulfurous smell.

It is useful for responders to know which odors are associated with various nerve agents. The purpose is not to have on-scene responders attempt to identify which chemical agent has been released. Rather, the purpose is to encourage responders to be alert to what victims say about specific odors, using such statements as a first *clue* about which nerve agent might be present. Keep in mind, however, that contaminants may mask the agent's odor. For example, the sarin that was used in the Tokyo subway attack was said to have a foul, rather than a fruity, odor.

Signs that a nerve agent may have been released include:

- Explosions of nerve agents that dispense liquids, mist, or gases
- Explosions that seem only to destroy a package or bomb device
- Unscheduled or unusual spray being dispersed
- Abandoned spray devices
- Numerous dead animals, fish, and birds
- Lack of insect life
- Mass casualties without obvious trauma
- Definite pattern of casualties and common symptoms
- Civilian panic in potential target area

Nerve agents often are incorrectly referred to as gases, especially in Hollywood movies. Nerve agents are liquids at ambient temperatures. These agents are usually clear and oily, with a high specific gravity and low volatility compared to water. All nerve agents have the potential to produce vapors when heated. To produce the greatest harm, these materials must be aerosolized. If these materials are dispensed as aerosols, the inhalation of vapors is extremely dangerous.

The presence of unusual chemicals and laboratory glassware, as well as underground "cookbooks," military manuals, or chemical textbooks may indicate the clandestine production of nerve agents. Similarly, a clandestine laboratory or storage site containing unusual chemicals in an unexpected or unlikely place may also indicate an intent to synthesize chemical agents.

Blister Agents (Vesicants)

The mustard gases of World War I are probably the most familiar blister agents. Blister agents are heavy, oily liquids. In a pure state, they are colorless and nearly odorless. In an impure state, they are dark-colored and have a strong odor that resembles mustard, onions, or garlic. These agents are extremely toxic: A few drops of mustard on the skin can cause severe injury; three grams absorbed through the skin can be fatal.

California Specialized Training Institute, 2019

Typically, symptoms take from two to twenty-four hours to manifest. First symptoms may include red, itchy, or painful skin, followed by blisters. Later symptoms may include pain or swelling in the eyes and lungs, tears in the eyes, and trouble breathing.

Outward warning signs of a possible blister agent release that the Assistant Safety-Officer Hazardous Materials (ASO-HazMat) and all on-scene responders should be alert to include:

- Explosions that dispense liquids, mist, or gas
- Explosions that seem only to destroy a package or bomb device
- Unscheduled and unusual spray being disseminated
- Abandoned spray devices

Blood Agents

Cyanide compounds are probably the most familiar blood agents. Blood agents lead to death by interfering with the blood's ability to transfer oxygen to the cells. This results in chemical asphyxiation. Although commonly thought to be a very deadly chemical, cyanide causes almost no effect after a brief exposure to low concentrations.

One of the telltale signs of cyanide poisoning is skin that is redder than normal. (This is because of the reddish blood going through a victim's veins.) No real physical signs or symptoms are apparent after a small exposure. Also, symptoms regress after the victim has been exposed to fresh air for a while. In moderate amounts, cyanide may produce nausea and dizziness, coupled with weakness and anxiety. A large concentration of cyanide will produce a loss of consciousness and death.

Victims that have been exposed to cyanide usually have normal-sized pupils, usually do not have excess secretions from the mouth, and, unlike nerve agent victims, do not have fasciculations (muscle twitches).

Certain industries commonly use cyanide in the manufacture of plastics, such as acrylics, and it is used in metal plate fabrication.

Signs that a blood agent may have been released include:

- Containers with markings that indicate the presence of cyanide
- Large numbers of casualties displaying common symptoms and reporting odors of peach blossoms or bitter almond
- Location (or occupancy)
- Physical symptoms (red skin)

Choking Agents (Pulmonary Agents)

Choking agents inflict injury mainly on the respiratory tract, including the nose, throat, and especially the lungs. Victims typically inhale these agents, which can all lead to pulmonary edema (fluid in the lungs) and respiratory failure. Examples of choking agents include chlorine, phosgene, diphosgene, and chloropicrin. Chlorine and phosgene were first used as a chemical warfare agent in World War I.

California Specialized Training Institute, 2019

Chlorine is a dense, pungent, greenish-yellow gas that is easily recognized by both color and odor. Because of its tendency to settle in low-lying areas, this gas is especially hazardous in closed spaces. Symptoms of chlorine exposure include ocular and nasal irritation, spasmodic coughing, and a feeling of suffocation.

Signs of pulmonary edema develop with continued exposure.

Whereas the majority of chlorine exposure-induced deaths occur in the first 24 hours, victims who survive the initial assault may live with minimal pathological or physiological sequelae.

During or immediately after exposure to dangerous concentrations of chlorine, the following signs and symptoms may develop:

- Coughing
- Chest tightness
- Burning sensation in the nose, throat, and eyes
- Watery eyes
- Blurred vision
- Nausea and vomiting
- Burning pain, redness, and blisters on the skin if exposed to gas; skin injury similar to frostbite if exposed to liquid chlorine
- Difficulty breathing or shortness of breath (may appear immediately if high concentrations of chlorine gas are inhaled, or may be delayed if low concentrations of chlorine gas are inhaled)
- Pulmonary edema within two to four hours

As a chemical warfare agent during World War I, phosgene was responsible for a large majority of deaths. (It is no longer used by the military.) Phosgene gas and liquid are irritants that can damage the skin, eyes, nose, throat, and lungs.

During or immediately after exposure to dangerous concentrations of phosgene, the following signs and symptoms may develop:

- Coughing
- Burning sensation in the throat and eyes
- Watery eyes
- Blurred vision
- Difficulty breathing or shortness of breath
- Nausea and vomiting

Skin contact can result in lesions similar to those from frostbite or burns. Following exposure to high concentrations of phosgene, a person may develop pulmonary edema within two to six hours.

The effects of exposure to phosgene may not be apparent for up to 48 hours after exposure, even if the person feels better or appears well once removed from exposure. As a result, people who have been exposed to phosgene should be monitored for at least 48 hours after exposure. Delayed effects that can appear for up to 48 hours include:

California Specialized Training Institute, 2019

- Difficulty breathing
- Coughing up white to pink-tinged fluid (a sign of pulmonary edema)
- Low blood pressure
- Heart failure

Both chlorine and phosgene can be found in industry, and chlorine is used in the purification of water. Most wastewater treatment facilities use large quantities of chlorine to purify water. Chlorine is also used in swimming pools in both the gas form and powdered form. Typically chlorine is containerized in 150-pound cylinders and one-ton cylinders. In industrial settings there may be thousands of pounds of chlorine. Chlorine has a very distinct smell (bleach), while phosgene generally smells like new-mown grass or hay.

Signs that a choking agent may have been released include:

- Location (or occupancy)
- Markings on containers
- Characteristic odors
- Physical symptoms

Irritating Agents

These agents are also known as riot-control agents or tear gas. They cause respiratory distress and copious tearing designed to incapacitate the victim. These agents are generally not lethal but, under certain situations, they can cause asphyxiation.

Another common compound that produces effects similar to tear gas is pepper spray. The active ingredient in pepper spray is capsaicin. This compound is basically essence of cayenne pepper. Incidents involving pepper spray in fast-food restaurants and in schools seem to be on the increase.

Victims complaining of burning and irritation of the eyes and throat will be among the first clues that an irritating agent has been used. In severe exposures, victims will complain of burning skin, abdominal pain and, in some cases, nausea and vomiting. People with asthma may experience an asthma attack as a result of exposure. The effects of these agents are generally temporary. Infants and the elderly will usually exhibit the most severe symptoms and secondary medical problems.

Pepper spray is manufactured in different strengths, usually 3 percent to 15 percent, and the strength is directly proportional to how long the incapacitation will last. The stronger the product, the longer its effects will last. People with allergies can have symptoms that last longer than for those who do not have allergies.

Signs that an irritating agent may have been released include:

- Characteristic peppery odor in the area of the event
- Characteristic peppery odor on the clothing of those exposed
- Reports of tear gas-like odor from those exposed

California Specialized Training Institute, 2019

- Identification of tear gas munitions used by the military or police
- Identification of personal protection devices
- Brownish-colored stains on objects near the site of the release
- Dye stains near the site of the suspected release

Vomiting Agents

Vomiting agents are a specific type of riot/control agent that is designed to make the exposed victim vomit. People who are rioting cannot fight the police or military if they are retching. While retching, victims must remove any respiratory protective equipment they are wearing. Adamsite (Agent DM) is one of the more common vomiting agents.

A common military tactic is to expose the enemy to a vomiting agent, which forces the troops to remove their gas masks, and then hit them with a nerve agent.

Incapacitating Agents

Incapacitating agents are drugs that make people unable to think clearly or that cause an altered state of consciousness (possibly unconsciousness). Following World War II, the U.S. military investigated a number of possible nonlethal chemical incapacitating agents. These agents included drugs such as LSD-25, marijuana derivatives, certain tranquilizers, and several glycolate anticholinergics. The U.S. military found a way to "weaponize" one of these compounds, 3-quinuclidinyl benzilate, which was given the code name BZ.

BZ is odorless and non-irritating, and because clinical effects are not seen for between 30 minutes to 24 hours, victims may not even know they have been exposed to the agent. Agent-15 is an alleged Iraqi incapacitating agent that is likely to be chemically either identical to BZ or closely related to it. These agents cause the victim to have severe psychological disturbances, such as decreased levels of concentration, short attention span, illusions, hallucinations, and impaired memory.

Industrial Chemicals

Many chemicals commonly used for commercial and industrial purposes are hazardous and pose the same threat to emergency responders as the chemicals the military has classified as blister, blood, choking, and nerve agents.

Common Chemicals	Effects Resemble
Organophosphate insecticide	Nerve agent
Dimethyl sulfate (DMS)	Blister agent
Methyl isocyanate	Blood/choking agent
Anhydrous ammonia	Coking agent
Sevin	Nerve agent
Malathion	Nerve agent

California Specialized Training Institute, 2019

Biological Agents

Biological agents are viruses, bacteria, or other germs (agents) that terrorists might use to cause illness or death in people, animals, or plants. These agents are typically found in nature, but it is possible that they could be changed to increase their ability to cause disease, make them resistant to current medicines, or to increase their ability to be spread into the environment. Biological agents can be spread through the air, through water, or in food.

By weight, biological agents are more toxic than chemical agents. For example, VX is considered the most toxic nerve agent. The biological toxin *botulinum* is 5,000 to 10,000 times more toxic by weight than VX.

Terrorists may use biological agents because they can be extremely difficult to detect and have an incubation period (do not cause illness for several hours to several days). This incubation period makes recognizing a biological terrorist incident extremely difficult. Some bioterrorism agents, such as the smallpox virus, can be spread from person to person and some, such as anthrax, cannot. Biological agents are invisible to the human senses: They cannot be seen, tasted, heard, felt, or smelled.

The first indication of a bioterrorist incident will probably be a significant increase in 911 calls and EMS responses for people who are experiencing flu-like symptoms. An on-scene sign that a bioterrorist attack might have occurred is an abandoned dissemination device, such as a garden sprayer, next to a building's heating, ventilation, and air conditioning system. Terrorists might also provide a verbal or written threat about the attack.

In 1984, two members of an Oregon cult led by Bhagwan Shree Rajneesh cultivated salmonella bacteria. They used the salmonella to contaminate restaurant salad bars. Their intent was to influence a local election. A total of 751 people became ill and 45 were hospitalized; there were no fatalities.

In terms of emergency response, it is important to very quickly identify the event as a bioterrorist attack to minimize its impact. The key to early identification is being able to recognize that the illness is not typical, such as allergies or influenza, but that is something unusual or has not been seen before.

Being able to provide timely intervention is one of the most important healthcare issues in dealing with biological terrorism. For example, treating for anthrax exposure within 24 hours yields a 90 percent survival rate. However, once symptoms have developed, the fatality rate is almost 90 percent, despite treatment.

radiological and nuclear

Of the five types of terrorist weapons described by the CBRNE, a nuclear weapon is the least likely form a terrorist organization would obtain and use. However, there is the potential for terrorists to obtain radiological materials and use those materials in a radiological dispersal device (RDD), or "dirty bomb." The detonation of such a device would cause widespread contamination and could also cause widespread panic.

Radiation cannot be detected by the human senses. It can only be detected with specific detection and monitoring equipment. As a result, the outward warning signs for nuclear terrorism may be as subtle as those for biological incidents. If a dirty bomb is used, there would be an explosion. If containers are

California Specialized Training Institute, 2019

involved, they may be marked with Department of Transportation (DOT) labels. Similarly, if vehicles are involved, they may be placarded.

Signs that a radiological or nuclear device may have been used include:

- Containers or vehicles with labels or placards
- Container shape
- Explosions
- Large fire without readily available fuel/ignition sources

Explosives

When an explosion occurs, its location or the population affected may offer clues that the incident is a terrorist attack. For example, residential properties are the target of choice for terrorists, followed by commercial properties, vehicles, and schools. The timing of the incident can also provide the first responder with clues as to the nature of the incident. More bombings take place during the months of July, August, and September than any other part of the year. The most active day of the week is Monday.

Another form of terrorist attack is called the "ambush" motive. The ambush motive presents an extremely hazardous situation for responders. In this scenario, the bomber lures first responders to a scene by detonating a small device to create an emergency incident. When the incoming police, fire, and EMS units arrive on scene, they become victims of a secondary device intended for a larger crowd.

Truck bombs are another type of explosive weapon. Truck bombs are manufactured at a remote location, and then driven to the target. A clue that a truck bomb explosion may be imminent is to see occupants jump out of a vehicle and flee on foot or take cover.

The predominant injuries among survivors of explosions include standard penetration and puncture injuries, blunt trauma, and ruptured eardrums. "Blast lung" is the most common fatal injury among initial survivors. Blast lung is caused when the overpressure from the explosion ruptures the alveoli and capillaries in the lungs, causing the victim to cough up frothy blood from the mouth and nose.

Other signs that an explosive device may have been used include:

- Shockwave with a loud noise
- Blast damage
- Actual devices
- Grey-out (dust clouds of concrete powder, etc.)

California Specialized Training Institute, 2019

reporting Terrorist Incidents

Emergency response agencies typically have a standard operating procedure that outlines who gets notified for each specific type of emergency. It is important for the ASO-HazMat to know who should receive information regarding a terrorist incident. The easiest and safest way to report a terrorist incident is by telephone. Of course, this assumes that telephones are still working.

During incidents involving explosives, cellular phones may not work. First-due emergency units should restrict or discontinue radio, cellular, and mobile data terminal communications within 450 feet of any explosives. Radio transmitters can create a field of electric energy that is sufficient to trigger electric blasting caps. Low-frequency transmissions are more dangerous.

The following distances can be used as a general guide:

Transmitter Wattage	Stand-Off Distance (feet)
5–25	100
50–100	220
100–250	450

Many federal agencies have some responsibility for managing the crisis that may result from a terrorist act or the consequences of such an event. These federal agencies may have large pools of resources—such as equipment, personnel, expertise, and financial assistance—that can greatly benefit local governments.

California Specialized Training Institute, 2019



Appendixes

Organization, Personnel, Major Responsibilities and Procedures of the Assistant Safety Officer-Hazardous Materials

The content in this section was excerpted and slightly adapted from the *Incident Command System Position Manual Assistant Safety Officer: Hazardous Materials* (ICS-HM-222-5), April 15, 1996. This information is relative to the Incident Command System (ICS) component of the National Interagency Incident Management System (NIIMS). This is the same ICS developed by FIRESCOPE.

Additional information and documentation can be obtained from the State Board of Fire Services, State Fire Marshal, 7171 Bowling Drive Suite 600, Sacramento, California, 95823, (916) 262-1958 or Support Services Manager, Operations Coordination Center, PO Box 55157, Riverside, California, 92517, (909) 782-4174.

Organization

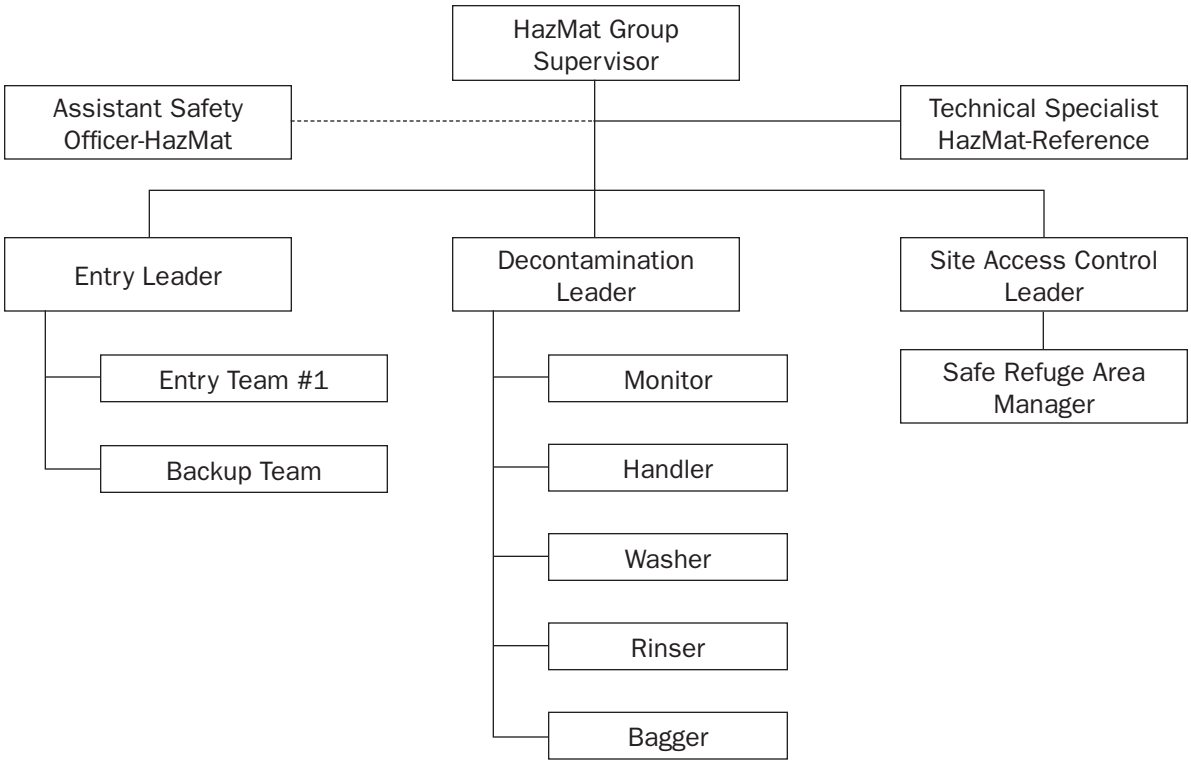
The Assistant Safety Officer-Hazardous Materials reports directly to the Incident Safety Officer. The Assistant Safety Officer-Hazardous Materials coordinates with the Hazardous Materials Group Supervisor or Hazardous Materials Branch Director, if activated. This position is responsible for the overall safety of assigned personnel within the Hazardous Materials Group.

In an incident involving multiple emergency activities, the Assistant Safety Officer-Hazardous Materials does not act as the Safety Officer for the overall incident. Therefore, it is necessary that an Assistant Safety Officer-Hazardous Materials be appointed at all hazardous materials incidents.

The Assistant Safety Officer-Hazardous Materials is positioned organizationally in the Hazardous Materials Group as illustrated below:

California Specialized Training Institute, 2009

Hazardous Materials Group Module Organization



Personnel

The Assistant Safety Officer-Hazardous Materials coordinates activities directly relating to the Hazardous Materials Group or Hazardous Materials Branch, if activated, operations as mandated by 29 CFR 1910.120 (q). This position advises the Hazardous Materials Group Supervisor or Hazardous Materials Branch Director, if activated, on all aspects of health and safety and has the authority to stop or prevent unsafe acts. Due to the responsibilities of this position, it is imperative that the individual be ICS Safety Officer qualified, and possess a high degree of knowledge in hazardous substance mitigation operations and procedures being implemented at the emergency response site. These responsibilities require that the personnel assigned to this position have a minimum equivalent training and expertise as mandated by federal, state, and local laws.

Major Responsibilities and Procedures

The major responsibilities of the Assistant Safety Officer-Hazardous Materials and procedures for implementing each responsibility are stated below. Users of this manual should feel free to augment this list as necessary. Note that some activities are one-time actions while others are ongoing or repetitive for the duration of the incident.

California Specialized Training Institute, 2009

A. Check-in and obtain briefing from the Incident Safety Officer

1. Complete check-in list (ICS Form 211).
2. If reporting directly to an assignment, check in via radio.
3. Request and receive briefing, which includes:
   a. Incident Briefing Form (ICS Form 201) or the equivalent information verbally
   b. Initial instructions concerning work activities
4. Obtain Incident Action Plan when available.
5. Start Unit/ Activity Log (ICS Form 214)

B. Obtain briefing from the Hazardous Materials Group Supervisor or Hazardous Materials Branch Director (if activated)

1. Obtain information on Hazardous Materials Group or Hazardous Materials Branch operational objectives.
2. Obtain names and contact information (locations, radio frequencies, etc.) for key personnel.

C. Participate in the preparation and implementation of a written Site Safety Plan (ICS Form 208)

1. Survey site and review documentation (maps, aerial photographs).
2. Review Base, Command Post and the hazard site Evacuation Plans.
3. Review the Medical Plan.
4. Review current weather data and future weather forecasts.
5. Develop recommendations for the Incident Action Plan and Site Safety Plan (ICS Form 208).
6. Attend briefings and planning meetings.

D. Advise the Hazardous Materials Group Supervisor or Hazardous Materials Branch Director (if activated) of deviations from the Site Safety Plan (ICS Form 208) or any dangerous situations

1. Maintain an expedient form of communication with Hazardous Materials Group Supervisor or Hazardous Materials Branch Director (if activated).
2. Brief the Hazardous Materials Group or Hazardous Materials Branch Director (if activated) on known or foreseeable problems and possible mitigation measures.
3. Conduct frequent and continuous visual inspections to ensure compliance with the Site Safety Plan (ICS Form 208).
4. Monitor radio traffic within the Hazardous Materials Group or Hazardous Materials Branch (if activated).

California Specialized Training Institute, 2009

E. Has full authority to alter, suspend, or terminate any activity that may be judged to be unsafe in an IDLH condition and/ or involves an imminent danger

1. Notify the Incident Safety Officer of altered, suspended or terminated activities.
    a. Notify the Hazardous Materials Group Supervisor or Hazardous Materials Branch Director (if activated).
2. Document attempted and completed communication relating to the use of this authority as soon as possible.
    a. Diagram, photograph, and obtain witnesses' names where possible.
    b. Use the Unit/ Activity Log (ICS Form 214)

F. Ensure the protection of the Hazardous Materials Group or Hazardous Materials Branch (if activated) personnel from physical, environmental, and chemical hazards/ exposures

1. Review and approve recommendations for Personal Protective Equipment and procedures relating to known hazardous materials involved.
2. Observe Group or Branch (if activated) operations personally and conduct interviews with operational personnel.

G. Ensure the provision of required emergency medical services for assigned personnel and coordinate with the Medical Unit Leader

1. Maintain periodic communication and review the Site Safety Plan (ICS Form 208) with the Medical Unit Leader.
2. Review Emergency Medical Management Protocol for a hazardous materials exposure with Medical Unit Leader.
3. Review personnel, apparatus, and procedures provided for such protection.
    a. Standby emergency medical service personnel, rescue devices, and emergency field decontamination plan.

H. Ensure that medical related records for the Hazardous Materials Group or Hazardous Materials Branch (if activated) personnel are maintained

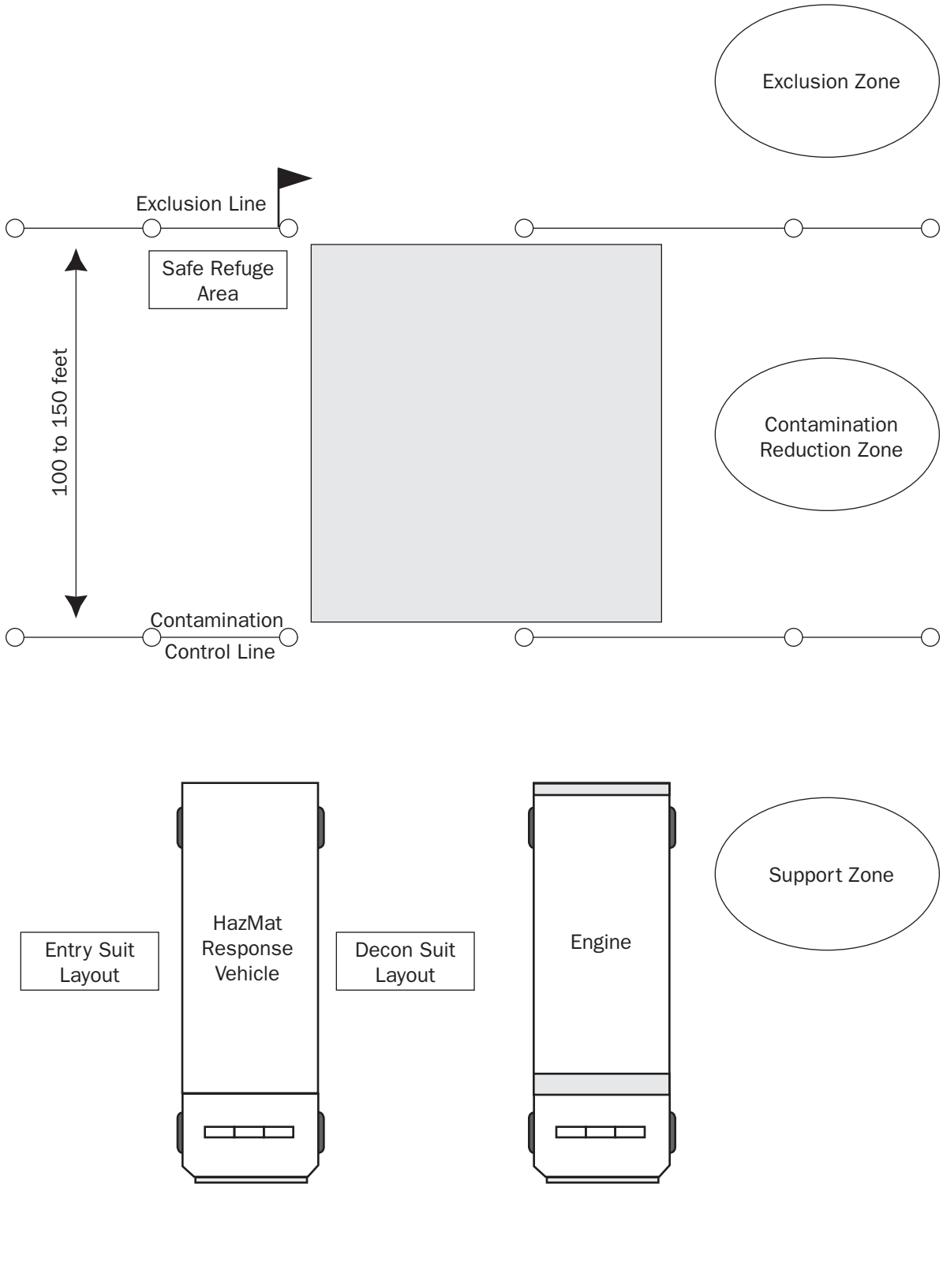
1. Ensure that exposure records are completed and filed with Documentation Unit.

I. Maintain Unit/Activity Log (ICS Form 214)

1. Record significant events or actions taken on the Unit/ Activity Log.
2. Submit Unit/Activity Log through Incident Safety Officer to the Documentation Unit at the end of each operational period.

California Specialized Training Institute, 2009

Control Zone Layout



California Specialized Training Institute, 2009

Assistant Safety Officer-Hazardous Materials Checklist

Directions: Consider this checklist as a minimum requirement for this position. Feel free to augment this list as necessary.

- ☐ A. Check in and obtain briefing from Incident Safety Officer.
- ☐ B. Obtain briefing from the Hazardous Materials Group Supervisor or Hazardous Materials Branch Director (if activated).
- ☐ C. Participate in the preparation and implementation of a written Site Safety Plan (ICS Form 208).
- ☐ D. Advise the Hazardous Materials Group Supervisor or Hazardous Materials Branch Director (if activated) of deviations from the Site Safety Plan (ICS Form 208) or any dangerous situations.
- ☐ E. Has full authority to alter, suspend or terminate any activity that may be judged to be unsafe in an IDLH condition and/ or involves an imminent danger.
- ☐ F. Ensure the protection of the Hazardous Materials Group or Hazardous Materials Branch (if activated) personnel from physical, environmental, and chemical hazards/ exposures.
- ☐ G. Ensure the provision of required emergency medical services for assigned personnel and coordinate with Medical Unit Leader.
- ☐ H. Ensure that medical-related records for the Hazardous Materials Group or Hazardous Materials Branch (if activated) personnel are maintained.
- ☐ I. Maintain Unit/Activity Log (ICS Form 214).

California Specialized Training Institute, 2009

California Code of Regulations: Title 8–Section 5192 of the General Industry Safety Orders

5192: Hazardous Waste Operations and Emergency Response

(a) Scope, Application, and Definitions

(1) Scope

This section covers the following operations, unless the employer can demonstrate that the operation does not involve employee exposure or the reasonable possibility for employee exposure to safety or health hazards:

(A) Clean-up operations or hazardous substance removal work required by a governmental body, whether Federal, state, local or other involving hazardous substances that are conducted at uncontrolled hazardous waste sites (including, but not limited to, the Environmental Protection Agency's (EPA) National Priority Site List (NPL), state priority site lists, sites recommended for the EPA, NPL, and initial investigations of government identified sites which are conducted before the presence or absence of hazardous substances has been ascertained);

(B) Corrective actions involving hazardous waste clean-up operations at sites covered by the Resource Conservation and Recovery Act of 1976 (RCRA) as amended (42 U.S.C. 6901. et seq.) and Chapters 6.5 and 6.8 of Division 20 of the California Health and Safety Code;

(C) Voluntary clean-up operations at sites recognized by Federal, state, local or other governmental bodies as uncontrolled hazardous waste sites;

(D) Operations involving hazardous wastes that are conducted at treatment, storage, and disposal (TSD) facilities regulated by 40 CFR Parts 264 and 265 pursuant to RCRA; or facilities regulated by Chapter 6.5 of Division 20 of the California Health and Safety Code; or by agencies under agreement with U.S.E.P.A. to implement RCRA regulations; and

(E) Emergency response operations for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard.

California Specialized Training Institute, 2009

(2) Application

(A) All requirements of Title 8 of the California Code of Regulations apply pursuant to their terms to hazardous waste operations (whether covered by this section or not). If there is a conflict or overlap, the provision more protective of employee safety and health shall apply without regard to 8 CCR 3202(a).

(B) Hazardous substance clean-up operations within the scope of subsections (a)(1)(A) through (a)(1)(C) of this section must comply with all subsections of this section except subsections (p) and (q).

(C) Operations within the scope of subsection (a)(1)(D) of this section must comply only with the requirements of subsection (p) of this section.

Notes and Exceptions to (a)(2)(C):

A. All provisions of subsection (p) of this section cover any treatment, storage, or disposal (TSD) operation regulated by 40 CFR parts 264 and 265 or by Chapter 6.5 of Division 20 of the California Health and Safety Code, and required to have a permit or interim status from EPA pursuant to 40 CFR 270.1 or from the Department of Health Services (DHS) pursuant to Chapter 6.5 of Division 20 of the California Health and Safety Code.

B. Employers who are not required to have a permit or interim status because they are conditionally exempt small quantity generators under 40 CFR 261.5 or are generators who qualify under 40 CFR 262.34 for exemptions from regulation under 40 CFR parts 264, 265 and 270 ("excepted employers") are not covered by subsections (p)(1) through (p)(7) of this section. Excepted employers who are required by the EPA or state agency such as the Department of Health Services (DHS) to have their employees engage in emergency response or who direct their employees to engage in emergency response are covered by subsection (p)(8) of this section, and cannot be exempted by (p)(8)(A) of this section. Excepted employers who are not required to have employees engage in emergency response, who direct their employees to evacuate in the case of such emergencies and who meet the requirements of subsection (p)(8)(A) of this section are exempt from the balance of subsection (p)(8) of this section.

C. If an area is used for hazardous waste treatment, storage, or disposal, any emergency response operations in that area shall comply with subsection (p)(8) of this section. In other areas not used for treatment storage, or disposal of hazardous waste, any emergency response operation shall comply with subsection (q) of this section. Compliance with the requirements of subsection (q) of this section shall be deemed to be in compliance with the requirements of subsection (p)(8) of this section.

D. Emergency response operations for releases of, or substantial threats of releases of, hazardous substances which are not covered by subsections (a)(1)(A) through (a)(1)(D) of this section must only comply with the requirements of subsection (q) of this section.

California Specialized Training Institute, 2009

(3) Definitions

Buddy system: A system of organizing employees into work groups in such a manner that each employee of the work group is designated to be observed by at least one other employee in the work group. The purpose of the buddy system is to provide quick assistance to employees in the event of an emergency.

Certified employee: An employee that has completed all of the requirements for training certification delineated in subsection (e)(6) of this section.

Certified supervisor: A supervisor that has completed all of the requirements for training certification delineated in subsection (e)(6) of this section.

Clean-up operation: An operation where hazardous substances are removed, contained, incinerated, neutralized, stabilized, cleared-up, or in any other manner processed or handled with the ultimate goal of making the site safer for people or the environment.

Decontamination: The removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health effects.

Emergency response, or responding to emergencies: A response effort by employees from outside the immediate release area or by other designated responders (i.e., mutual aid groups, local fire departments, etc.) to an occurrence which results, or is likely to result, in an uncontrolled release, which may cause high levels of exposure to toxic substances, or which poses danger to employees requiring immediate attention. Responses to incidental releases of hazardous substances where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area, or by maintenance personnel are not considered to be emergency responses within the scope of this standard. Responses to releases of hazardous substances where there is no immediate safety or health hazard (i.e., fire, explosion, or chemical exposure) are not considered to be emergency responses.

Note: The "immediate release area" can be the entire geographic boundary of the employee's assigned work area.

Facility: A. Any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, storage container, motor vehicle, rolling stock, or aircraft, or B. any site or area where a hazardous substance has been deposited, stored, disposed of, placed, or otherwise come to be located; but does not include any consumer product in consumer use or any water-borne vessel.

Hazardous materials response (HAZMAT) team: An organized group of employees, designated by the employer, which is expected to perform work to handle and control actual or potential leaks or spills of hazardous substances requiring possible close approach to the substance. The team members perform responses to releases or potential releases of hazardous substances for the purpose of control or stabilization of the incident. A HAZMAT team is not a fire brigade nor is a typical fire brigade a HAZMAT team. A HAZMAT team, however, may be a separate component of a fire brigade or fire department.

California Specialized Training Institute, 2009

Hazardous substance: Any substance designated or listed under A. through D. below, exposure to which results or may result in adverse affects on the health or safety of employees:

A. Any substance defined under Section 101(14) of CERCLA or under Sections 25316 and 25317 of the California Health and Safety Code;

B. Any biological agent and other disease-causing agent which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any person, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations in such persons or their offspring;

C. Any substance listed by the U.S. Department of Transportation and regulated as hazardous materials under 49 CFR 172.101 and appendices; and

D. Hazardous waste as herein defined.

Hazardous substance removal work: Clean-up work at any of the following:

A. A site where removal or remedial action is taken pursuant to any of the following:

1. Chapter 6.8 (commencing with Section 25300) of Division 20 of the Health and Safety Code, regardless of whether the site is listed pursuant to Section 25356 of the Health and Safety Code.

2. The federal Comprehensive Environmental Response, Compensation and Liability Act of 1980 (42 U.S.C. Sec. 9601 et seq.).

3. Any operations covered under subsections(a)(1)(A) through (a)(1)(C) of this section.

B. A site where corrective action is taken pursuant to Section 25187 or 25200.10 of the Health and Safety Code or the federal Resource Conservation and Recovery Act of 1976 (42 U.S.C. Sec. 6901 et seq.)

C. A site where clean-up of a discharge of a hazardous substance is required pursuant to Division 7 (commencing with Section 13000) of the Water Code.

D. A site where removal or remedial action is taken because a hazardous substance has been discharged or released in an amount that is reportable pursuant to Section 13271 of the Water Code or the federal Comprehensive Environmental Response, Compensation and Liability Act of 1980 (42 U.S.C. Sec. 6901 et seq.). Hazardous substance removal work does not include work related to a hazardous substance spill on a highway.

Hazardous waste: A waste or combination of wastes as defined in 40 CFR 261.3, or regulated as hazardous waste in California pursuant to Chapter 6.5, Division 20, California Health and Safety Code, or B. those substances defined as hazardous wastes in 49 CFR 171.8.

Hazardous waste operation: Any operation conducted within the scope of this regulation including hazardous substance removal work as defined in Labor Code Section 142.7(b).

California Specialized Training Institute, 2009

Hazardous waste site, or site: Any facility or location at which hazardous waste operations within the scope of this regulation take place.

Health hazard: A chemical, mixture of chemicals or a pathogen for which there is statistically significant evidence, based on at least one study conducted in accordance with established scientific principles, that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens; toxic or highly toxic agents; reproductive toxins; irritants; corrosives; sensitizers; hepatotoxins; nephrotoxins; neurotoxins; agents which act on the hematopoietic system; and agents which damage the lungs, skin, eyes, or mucous membranes. It also includes stress due to temperature extremes. Further definition of the terms used above can be found in Title 8, California Code of Regulations, Section 5194.

IDLH or immediately dangerous to life or health: An atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere.

Incidental release: An incidental release is one that does not cause a health or safety hazard to employees and does not need to be cleaned up immediately to prevent death or serious injury to employees.

Oxygen deficiency: That concentration of oxygen by volume below which air supplying respiratory protection must be provided. It exists in atmospheres where the percentage of oxygen by volume is less than 19.5 percent oxygen.

Permissible exposure limit (PEL): The exposure, inhalation or dermal permissible exposure limit specified in 8 CCR, Chapter 4, Subchapter 7, Groups 14 and 15; and Group 16, Articles 107, 109, and 110.

Post-emergency response: That portion of an emergency response performed after the immediate threat of a release has been stabilized or eliminated and clean-up of the site has begun. If post emergency response is performed by an employer's own employees who were part of the initial emergency response, it is considered to be part of the initial response and not post-emergency response. However, if a group of an employer's own employees, separate from the group providing initial response, performs the clean-up operation, then the separate group of employees would be considered to be performing post-emergency response and subject to subsection (q)(11) of this section.

Pre-job health and safety conference: A health and safety conference or briefing held prior to entering a site for the purpose of initiating hazardous substance removal work.

Published exposure level: The exposure limits published in "NIOSH Recommendations for Occupational Safety and Health Standards 1988" incorporated by reference, or if no limit is specified, the exposure limits published in the standards specified by the American Conference of Governmental Industrial Hygienists in their publication "Threshold Limit Values and Biological Exposure Indices for 1989-90" dated 1989 incorporated by reference.

Qualified person: A person with specific training, knowledge and experience in the area for which the person has the responsibility and the authority to control.

California Specialized Training Institute, 2009

Site safety and health supervisor (or official): The individual located on a hazardous waste site who is responsible to the employer and has the authority and knowledge necessary to implement the site safety and health plan and verify compliance with applicable safety and health requirements.

Small quantity generator: A generator of hazardous wastes who in any calendar month generates no more than 1,000 kilograms (2,205 pounds) of hazardous waste in that month.

Uncontrolled hazardous waste site: An area where an accumulation of hazardous waste creates a threat to the health and safety of individuals or the environment or both. Some sites are found on public lands, such as those created by former municipal, county, or state landfills where illegal or poorly managed waste disposal has taken place. Other sites are found on private property, often belonging to generators or former generators of hazardous waste. Examples of such sites include, but are not limited to, surface impoundments, landfills, dumps, and tank or drum farms.

Normal operations at TSD sites are not covered by this definition.

Uncontrolled release: An uncontrolled release is the accidental release of a hazardous substance from its container. If not contained, stopped, and removed, the release would pose a hazard to the employees in the immediate area or in areas in the path of the release, or from its byproducts or its effects (such as toxic vapors, fire, over-pressurization, toxic gases, or toxic particulates.

(b) Safety and Health Program

Note to (b): Safety and health programs developed and implemented to meet other Federal, state, or local regulations are considered acceptable in meeting this requirement if they cover or are modified to cover the topics required in this subsection. An additional or separate safety and health program is not required by this subsection.

(1) General

(A) Employers shall develop and implement a written safety and health program for their employees involved in hazardous waste operations. The program shall be designed to identify, evaluate, and control safety and health hazards, and provide for emergency response for hazardous waste operations.

(B) The written safety and health program shall incorporate the following:

1. An organization structure;
2. A comprehensive workplan;
3. A site-specific safety and health plan which need not repeat the employer's standard operating procedures required in subsection (b)(1)(B)6. of this section;
4. The safety and health training program;
5. The medical surveillance program;
6. The employer's standard operating procedures for safety and health; and

California Specialized Training Institute, 2009

7. Any necessary interface between general program and site specific activities.

(C) Site excavation. Site excavations created during initial site preparation or during hazardous waste operations shall be shored or sloped as appropriate to prevent accidental collapse in accordance with 8 CCR, Chapter 4, Subchapter 4, Article 6.

(D) Contractors and sub-contractors. An employer who retains contractor or sub-contractor services for work in hazardous waste operations shall inform those contractors, sub-contractors, or their representatives of the site emergency response procedures and any potential fire, explosion, health, safety or other hazards of the hazardous waste operation that have been identified by the employer, including those identified in the employer's information program. Each contractor/sub-contractor is responsible for compliance with all safety and health protection requirements for its employees. An employer's safety and health plan can be used by contractors/sub-contractors at the site if it appropriately addresses their activity and potential safety and health hazards.

(E) Program availability. The written safety and health program shall be made available to any contractor or subcontractor or their representative who will be involved with the hazardous waste operation; to employees; to employee designated representatives; to Division representatives, and to personnel of other Federal, state, or local agencies with regulatory authority over the site.

(2) Organizational structure part of the site program

(A) The organizational structure part of the program shall establish the specific chain of command and specify the overall responsibilities of supervisors and employees. It shall include, at a minimum, the following elements:

1. A general supervisor (or Certified supervisor for hazardous substance removal work) who has the responsibility and authority to direct all hazardous waste operations.
2. A Site Safety and Health Supervisor who has the responsibility and authority to develop and implement the site safety and health plan and verify compliance.
3. A Qualified Person for operations defined as hazardous substance removal work, who shall be responsible for scheduling any air sampling, laboratory calibration of sampling equipment, evaluation of soil or other contaminated materials sampling results, and for conducting any equipment testing and evaluating the results of the tests.
4. All other personnel needed for hazardous waste site operations and emergency response and their general functions and responsibilities.
5. The lines of authority, responsibility, and communication.

(B) The organizational structure shall be reviewed and updated as necessary to reflect the current status of waste site operations.

(3) Comprehensive workplan part of the site program

The comprehensive workplan part of the program shall address the tasks and objectives of the site operations and the logistics and resources required to reach those tasks and objectives.

California Specialized Training Institute, 2009

(A) The comprehensive workplan shall address anticipated clean-up activities, as well as normal operating procedures, which need not repeat the employer's procedures available elsewhere.

(B) The comprehensive workplan shall define work tasks and objectives and identify the methods for accomplishing those tasks and objectives.

(C) The comprehensive workplan shall establish personnel requirements for implementing the plan.

(D) The comprehensive workplan shall provide for the implementation of the training required in subsection (e) of this section.

(E) The comprehensive workplan shall provide for the implementation of the required informational programs required in subsection (i) of this section.

(F) The comprehensive workplan shall provide for the implementation of the medical surveillance program described in subsection (f) of this section.

(4) Site-specific safety and health plan part of the program

(A) General: The site safety and health plan, which must be kept on site, shall address the safety and health hazards of each phase of site operation and include the requirements and procedures for employee protection.

Note to (A): In general, a site plan organized as a single document, with component sections/appendices covering all tasks, operations, and contractors/sub-contractors, may be used to promote use efficiency, and enhance completeness, clarity, and coordination.

(B) Elements: The site safety and health plan, as a minimum, shall address the following:

1. A safety and health risk or hazard analysis for each site task and operation found in the workplan.
2. Employee training assignments to assure compliance with subsection (e) of this section.
3. Personal protective equipment (PPE) to be used by employees for each of the site tasks and operations being conducted as required by the personal protective equipment program in subsection (g)(5) of this section.
4. Medical surveillance requirements in accordance with the program in subsection (f) of this section.
5. Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment to be used.
6. Site control measures in accordance with the site control program required in subsection (d) of this section.
7. Decontamination procedures in accordance with subsection (k) of this section.

California Specialized Training Institute, 2009

8. An emergency response plan meeting the requirements of subsection (l) of this section for safe and effective responses to emergencies, including the necessary PPE and other equipment.
9. Confined space entry procedures.
10. A spill containment program meeting the requirements of subsection (j) of this section.

(C) Pre-entry briefing: The site-specific safety and health plan shall provide for pre-entry briefings to be held prior to initiating any site activity, and at such other times as necessary to ensure that employees are apprised of the site safety and health plan and that this plan is being followed. The information and data obtained from site characterization and analysis work required in subsection (c) of this section shall be used to prepare and update the site safety and health plan.

(D) For operations defined as Hazardous substance removal work, a Pre-job health and safety conference shall be held before the start of actual work. The conference shall include representatives of the owner or contracting agency, the contractor, the employer, employees, and employee representatives; and shall include a discussion of the employer's safety and health program and the means, methods, devices, processes, practices, conditions, or operations which the employer intends to use in providing a safe and healthy place of employment.

(E) Effectiveness of site safety and health plan: Inspections shall be conducted by the site safety and health supervisor or, in the absence of that individual, another individual who is knowledgeable in occupational safety and health, acting on behalf of the employer as necessary to determine the effectiveness of the site safety and health plan. Any deficiencies in the effectiveness of the site safety and health plan shall be corrected by the employer.

(c) Site Characterization and Analysis

(1) General

Hazardous waste sites shall be evaluated in accordance with this subsection to identify specific site hazards and to determine the appropriate safety and health control procedures needed to protect employees from the identified hazards.

(2) Preliminary evaluation

A preliminary evaluation of a site's characteristics shall be performed prior to site entry by a qualified person to aid in the selection of appropriate employee protection methods prior to site entry. Immediately after initial site entry, a more detailed evaluation of the site's specific characteristics shall be performed by a qualified person to further identify existing site hazards and to further aid in the selection of the appropriate engineering controls and personal protective equipment for the tasks to be performed.

(3) Hazard identification

All suspected conditions that may pose inhalation or skin absorption hazards that are immediately dangerous to life or health (IDLH) or other conditions that may cause death or serious

California Specialized Training Institute, 2009

harm shall be identified during the preliminary survey and evaluated during the detailed survey. Examples of such hazards include, but are not limited to, confined space entry, potentially explosive or flammable situations, visible vapor clouds, or areas where biological indicators such as dead animals or vegetation are located.

(4) Required information

The following information to the extent available shall be obtained by the employer prior to allowing employees to enter a site:

(A) Location and approximate size of the site.

(B) Description of the response activity and/or the job task to be performed.

(C) Duration of the planned employee activity.

(D) Site topography and accessibility by air and roads.

(E) Safety and health hazards expected at the site.

(F) Pathways for hazardous substance dispersion.

(G) Present status and capabilities of emergency response teams that would provide assistance to hazardous waste clean-up site employees at the time of an emergency.

(H) Hazardous substances and health hazards involved or expected at the site, and their chemical and physical properties.

(5) Personal protective equipment

Personal protective equipment (PPE) shall be provided and used during initial site entry in accordance with the following requirements:

(A) Based upon the results of the preliminary site evaluation, an ensemble of PPE shall be selected and used during initial site entry which will provide protection to a level of exposure below PELs and published exposure levels for known or suspected hazardous substances and health hazards and will provide protection against other known and suspected hazards identified during the preliminary site evaluation. If there is no PEL or published exposure level, the employer may use other published studies and information as a guide to appropriate personal protective equipment.

(B) If positive-pressure self-contained breathing apparatus is not used as part of the entry ensemble, and if respiratory protection is warranted by the potential hazards identified during the preliminary site evaluation, an escape self-contained breathing apparatus of at least five minute's duration shall be carried by employees during initial site entry.

(C) If the preliminary site evaluation does not produce sufficient information to identify the hazards or suspected hazards of the site, an ensemble providing protection equivalent to Level B PPE shall be provided as minimum protection and direct reading instruments shall be used as appropriate for identifying IDLH conditions. (See Appendix B for guidelines on Level B protective equipment, and a description of Level B hazards.)

California Specialized Training Institute, 2009

(D) Once the hazards of the site have been identified, the appropriate PPE shall be selected and used in accordance with subsection (g).

(6) Monitoring

The following monitoring shall be conducted during initial site entry when the site evaluation produces information that shows the potential for ionizing radiation or IDLH conditions, or when the site information is not sufficient to rule out these possible conditions:

(A) Monitoring with direct reading instruments for hazardous levels of ionizing radiation.

(B) Monitoring the air with appropriate direct reading test equipment (i.e., combustible gas meters, detector tubes) for IDLH and other conditions that may cause death or serious harm (combustible or explosive atmospheres, oxygen deficiency, toxic substances.)

(C) Visually observing for signs of actual or potential immediately dangerous to life or health (IDLH) or other dangerous conditions.

(D) An on-going air monitoring program in accordance with subsection (h) shall be implemented after site characterization has determined the site is safe for the start-up of operations.

(7) Risk identification

Once the presence and concentrations of specific hazardous substances and health hazards have been established, the risks associated with these substances shall be identified. Employees who will be working on the site shall be informed of any risks that have been identified. In situations covered by the Hazard Communication standard, 8 CCR 5194, training required by that standard need not be duplicated.

Note to (c)(7): Risks to consider include, but are not limited to:

A. Exposures exceeding the PELs, and published exposure levels.

B. IDLH concentrations.

C. Potential skin absorption and irritation sources.

D. Potential eye irritation sources.

E. Explosion sensitivity and flammability ranges.

F. Oxygen deficiency.

(8) Employee notification

Any information concerning the chemical, physical, and toxicologic properties of each substance known or expected to be present on site that is available to the employer and relevant to the duties an employee is expected to perform shall be made available to the affected employees prior to the commencement of their work activities. The employer may utilize information developed for the hazard communication standard, 8 CCR 5194, for this purpose.

California Specialized Training Institute, 2009

(d) Site Control

(1) General

Appropriate site control procedures shall be implemented to control employee exposure to hazardous substances before clean-up work begins.

(2) Site control program

A site control program for protecting employees which is part of the employer's site safety and health program required in subsection (b) of this section shall be developed during the planning stages of a hazardous waste clean-up operation and modified as necessary as new information becomes available.

(3) Elements of the site control program

The site control program shall, as a minimum, include: A site map; site work zones; the use of a "buddy system;" site communications including alerting means for emergencies; the standard operating procedures or safe work practices; and, identification of nearest medical assistance. Where these requirements are covered elsewhere they need not be repeated.

(e) Training

(1) General

(A) All employees working on site (such as but not limited to equipment operators, general laborers, and others) exposed to hazardous substances, health hazards, or safety hazards, and their supervisors and management responsible for the site shall receive training meeting the requirements of this subsection before they are permitted to engage in hazardous waste operations that could expose them to hazardous substances, safety, or health hazards, and they shall receive review training as specified in this subsection.

(B) Employees shall not be permitted to participate in or supervise field activities until they have been trained to a level required by their job function and responsibility.

(2) Elements to be covered

The training shall thoroughly cover the following:

(A) Names of personnel and alternates responsible for site safety and health;

(B) Safety, health and other hazards present on the site;

(C) Use of PPE;

(D) Work practices by which the employee can minimize risks from hazards;

(E) Safe use of engineering controls and equipment on the site;

(F) Medical surveillance requirements including recognition of symptoms and signs which might indicate overexposure to hazards; and

California Specialized Training Institute, 2009

(G) Subsections 7 through 10 of the site safety and health plan set forth in subsection (b)(4)(B) of this section.

(3) Initial training

(A) General site workers (such as equipment operators, general laborers, and supervisory personnel) engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off the site, and a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor.

(B) Workers on site only occasionally for a specific limited task (such as, but not limited to, ground water monitoring, land surveying, or geo-physical surveying) and who are unlikely to be exposed over PELs and published exposure levels shall receive a minimum of 24 hours of instruction off the site, and the minimum of one day actual field experience under the direct supervision of a trained, experienced supervisor.

(C) Workers regularly on site who work in areas which have been monitored and fully characterized indicating that exposures are under PELs and published exposure levels where respirators are not necessary, and the characterization indicates that there are no health hazards or the possibility of an emergency developing, shall receive a minimum of 24 hours of instruction off the site and the minimum of one day actual field experience under the direct supervision of a trained, experienced supervisor.

(D) Workers with 24 hours of training who are covered by subsections (e)(3)(B) and (e)(3)(C) of this section, and who become general site workers or who are required to wear respirators, shall have the additional 16 hours and two days of training necessary to total the training specified in subsection (e)(3)(A).

(4) Management and supervisor training

On-site management and supervisors directly responsible for, or who supervise employees engaged in, hazardous waste operations shall receive 40 hours initial training, and three days of supervised field experience (the training may be reduced to 24 hours and one day if the only area of their responsibility is employees covered by subsections (e)(3)(B) and (e)(3)(C)) and at least eight additional hours of specialized hazardous waste operations management training at the time of job assignment on such topics as, but not limited to, the employer's safety and health program and the associated employee training program, PPE program, spill containment program, and health hazard monitoring procedure and techniques.

(5) Qualifications for trainers

Trainers shall be qualified to instruct employees about the subject matter that is being presented in training. Such trainers shall have satisfactorily completed a training program for teaching the subjects they are expected to teach, or they shall have the academic credentials and instructional experience necessary for teaching the subjects. Instructors shall demonstrate competent instructional skills and knowledge of the applicable subject matter.

California Specialized Training Institute, 2009

(6) Training certification

Employees and supervisors that have received and successfully completed the training and field experience specified in subsections (e)(1) through (e)(4) of this section shall be certified by their instructor or the head instructor and trained supervisor as having successfully completed the necessary training. A written certificate shall be given to each person so certified. Any person who has not been so certified or who does not meet the requirements of subsection (e)(9) of this section shall be prohibited from engaging in hazardous waste operations.

(7) Emergency response

Employees who are engaged in responding to hazardous emergency situations at hazardous waste clean-up sites that may expose them to hazardous substances shall be trained in how to respond to such expected emergencies.

(8) Refresher training

Employees specified in subsection (e)(1) of this section, and managers and supervisors specified in subsection (e)(4) of this section, shall receive eight hours of refresher training annually on the items specified in subsection (e)(2) and/or (e)(4) of this section, any critique of incidents that have occurred in the past year that can serve as training examples of related work, and other relevant topics.

(9) Equivalent training

Employers who can show by documentation or certification that an employee's work experience and/or training has resulted in training equivalent to that training required in subsections (e)(1) through (e)(4) of this section shall not be required to provide the initial training requirements of those subsections to such employees. However, certified employees or employees with equivalent training new to a site shall receive appropriate, site specific training before site entry and have appropriate supervised field experience at the new site. Equivalent training includes any academic training or the training that existing employees might have already received from actual hazardous waste site work experience.

(f) Medical Surveillance

(1) General

Employers engaged in operations specified in subsections (a)(1)(A) through (a)(1)(D) of this section and not covered by (a)(2)(C) exceptions, and employers of employees specified in subsection (q)(9) shall institute a medical surveillance program in accordance with this subsection.

(2) Employees covered

The medical surveillance program shall be instituted by the employer for the following employees:

California Specialized Training Institute, 2009

(A) Any employee who is or may be exposed to hazardous substances or health hazards at or above the PELs or, if there is no PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year.

(B) Any employee who wears a respirator during any part of a day for a period of 30 days or more in a year, or as required by 8 CCR 5144.

(C) Any employee who is injured, becomes ill or develops signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation; and

(D) Members of HAZMAT teams.

(3) Frequency of medical examinations and consultations

Medical examinations and consultations shall also be made available by the employer to each employee covered under subsection (f)(2) on the following schedules:

(A) For employees covered under subsections (f)(2)(A), (f)(2)(B), and (f)(2)(D):

1. Prior to assignment.
2. At least once every twelve months for each employee covered, unless the attending physician believes a longer interval (not greater than biennially) is appropriate.
3. At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last six months.
4. As soon as possible, upon notification by an employee either that the employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards or that the employee has been injured or exposed above the PELs or published exposure levels in an emergency situation.
5. At more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary.

(B) For employees covered under subsection(f)(2)(C) and for all employees including those of employers covered by subsection (a)(1)(E) who may have been injured, received a health impairment, developed signs or symptoms which may have resulted from exposure to hazardous substances resulting from an emergency incident, or exposed during an emergency incident to hazardous substances at concentrations above the PELs or the published exposure levels without the necessary personal protective equipment being used:

1. As soon as possible following the emergency incident or development of signs or symptoms;
2. At additional times, if the examining physician determines that follow-up examinations or consultations are medically necessary.

(4) Content of medical examinations and consultations

(A) Medical examinations required by subsection (f)(2) of this section shall include a medical and work history (or updated history if one is in the employee's file) with special emphasis on

California Specialized Training Institute, 2009

symptoms related to the handling of hazardous substances and health hazards, and to fitness for duty including the ability to wear any required PPE under conditions (e.g., temperature extremes) that may be expected at the work site.

(B) The content of medical examinations or consultations made available to employees pursuant to subsection (f) shall be determined by the examining physician. The guidelines in the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (see Appendix D, Reference #10) should be consulted.

(5) Examination by a physician and costs

All medical examinations and procedures shall be performed by or under the supervision of a licensed physician, preferably one knowledgeable in occupational medicine, and shall be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

(6) Information provided to the physician

The employer shall provide one copy of this standard and its appendices to the attending physician, and in addition, the following for each employee:

(A) A description of each employee's duties as they relate to the employee's exposures.

(B) Each employee's exposure levels or anticipated exposure levels.

(C) A description of any PPE used or to be used by each employee.

(D) Information from previous medical examinations of each employee which is not readily available to the examining physician.

(E) Information required by 8 CCR 5144 for each employee.

(7) Physician's written opinion

(A) The employer shall obtain and furnish the employee with a copy of a written opinion from the examining physician containing the following:

1. The physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response, or from respirator use.
2. The physician's recommended limitations upon the employee's assigned work.
3. A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further examination or treatment.

(B) The written opinion obtained by the employer shall not reveal specific findings or diagnoses unrelated to occupational exposures.

(C) The physician shall provide the results of the medical examination and tests to the employee if requested.

California Specialized Training Institute, 2009

(8) Recordkeeping

(A) An accurate record of the medical surveillance required by subsection (f) shall be retained. This record shall be retained for the period specified and meet the criteria of 8 CCR 3204.

(B) The record required in subsection (f)(8)(A) shall include at least the following information:

1. The name and social security number of the employee.
2. Physician's written opinions, recommended limitations, and results of examinations and tests.
3. Any employee medical complaints related to exposure to hazardous substances.
4. A copy of the information provided to the examining physician by the employer, with the exception of the standard and its appendices.

(g) Engineering Controls, Work Practices, and Personal Protective Equipment for Employee Protection

Engineering controls, work practices, PPE, or a combination of these shall be implemented in accordance with this subsection to protect employees from exposure to hazardous substances and safety and health hazards.

(1) Engineering controls, work practices and PPE for substances regulated in 8 CCR, Ch. 4, Subch. 7, Groups 14, 15, and 16

(A) Engineering controls and work practices shall be instituted to reduce and maintain employee exposure to or below the PELs of substances regulated by 8 CCR 5155, except to the extent that such controls and practices are not feasible.

Note to (g)(1)(A): Engineering controls which may be feasible include the use of pressurized cabs or control booths on equipment, and/or the use of remotely operated material handling equipment. Work practices which may be feasible are removing all non-essential employees from potential exposure during opening of drums, wetting down dusty operations and locating employees upwind of possible hazards.

(B) Whenever engineering controls and work practices are not feasible or not required, any reasonable combination of engineering controls, work practices, and PPE shall be used to protect employees to reduce exposure to or below established PELs or exposure limits for substances regulated by 8 CCR, Ch. 4, Subch. 7, Group 16.

(C) The employer shall not implement a schedule of employee rotation as a means of compliance with PELs or exposure limits except when there is no other feasible way of complying with the applicable ionizing radiation exposure standards.

(D) The provisions of 8 CCR, Ch. 4, Subch. 7, Groups 14 and 15 shall be followed.

California Specialized Training Institute, 2009

(2) Engineering controls, work practices, and PPE for substances not regulated in 8 CCR, Ch. 4, Subch. 7, Groups 14, 15, and 16

An appropriate combination of engineering controls, work practices, and personal protective equipment shall be used to reduce and maintain employee exposure to or below the published exposure levels for hazardous substances and health hazards not regulated by 8 CCR, Ch. 4, Subch. 7, Groups 14, 15, and 16. The employer may use the published literature and Material Safety Data Sheets (MSDS's) as a guide in making the employer's determination as to what level of protection the employer believes is appropriate for hazardous substances and health hazards for which there is no PEL or published exposure level.

(3) Personal protective equipment selection

(A) Personal protective equipment (PPE) shall be selected and used which will protect employees from the hazards and potential hazards they are likely to encounter as identified during the site characterization and analysis.

(B) Personal protective equipment selection shall be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, the task-specific conditions and duration, and the hazards and potential hazards identified at the site.

(C) Positive pressure self-contained breathing apparatus (SCBA) or positive pressure airline respirators equipped with an escape air supply shall be used when chemical exposure levels present will create a substantial possibility of immediate death, immediate serious illness or injury, or impair the ability to escape.

(D) Totally-encapsulating chemical protective suits (protection equivalent to Level A protection as recommended in Appendix B) shall be used in conditions where skin absorption of a hazardous substance may result in a substantial possibility of immediate death, immediate serious illness or injury, or impair the ability to escape.

(E) The level of protection provided by PPE selection shall be increased when additional information on site conditions shows that increased protection is necessary to reduce employee exposures below established PELs and published exposure levels for hazardous substances and health hazards. (See Appendix B for guidance on selecting PPE ensembles.)

(F) Personal protective equipment shall be selected and used to meet the requirements of 8 CCR, Ch. 4, Subch. 7, Group 2, Articles 10 and 10.1, and 8 CCR 5144 of the General Industry Safety Orders, and additional requirements specified in this section.

Note to (g)(3): The level of employee protection provided may be decreased when additional information or site conditions show that decreased protection will not result in hazardous exposures to employees.

(4) Totally-encapsulating chemical protective suits

(A) Totally-encapsulating suits shall protect employees from the particular hazards which are identified during site characterization and analysis.

California Specialized Training Institute, 2009

(B) Totally-encapsulating suits shall be capable of maintaining positive air pressure. (See Appendix A for a test method which may be used to evaluate this requirement.)

(C) Totally-encapsulating suits shall be capable of preventing inward test gas leakage of more than 0.5 percent. (See Appendix A for a test method which may be used to evaluate this requirement.)

(5) Personal protective equipment (PPE) program

A written personal protective equipment program, which is part of the employer's safety and health program required in subsection (b) of this section or required in subsection (p)(1) of this section and which is also a part of the site-specific safety and health plan shall be established. The PPE program shall address the elements listed below. When elements, such as donning and doffing procedures, are provided by the manufacturer of a piece of equipment and are attached to the plan, they need not be rewritten into the plan as long as they adequately address the procedure or element.

(A) PPE selection based upon site hazards,

(B) PPE use and limitations of the equipment,

(C) Work mission duration,

(D) PPE maintenance and storage,

(E) PPE decontamination and disposal,

(F) PPE training and proper fitting,

(G) PPE donning and doffing procedures,

(H) PPE inspection procedures prior to, during, and after use,

(I) Evaluation of the effectiveness of the PPE program, and

(J) Limitations during temperature extremes, heat stress, and other appropriate medical considerations.

(h) Monitoring

(1) General

(A) Monitoring shall be performed in accordance with this subsection where there may be a question of employee exposure to hazardous concentrations of hazardous substances in order to assure proper selection of engineering controls, work practices, and PPE so that employees are not exposed to levels which exceed PELs, or published exposure levels if there are no PELs, for hazardous substances.

(B) Air monitoring shall be used to identify and quantify airborne levels of hazardous substances, and health and safety hazards in order to determine the appropriate level of employee protection needed on site.

California Specialized Training Institute, 2009

(2) Initial entry

Upon initial entry, representative air monitoring shall be conducted to identify any IDLH conditions, exposure over PELs or published exposure levels, exposure over a radioactive material's dose limits, or other dangerous situations such as the presence of flammable atmospheres or oxygen-deficient environments.

(3) Periodic monitoring

Periodic monitoring shall be conducted when the possibility of an IDLH condition or flammable atmosphere has developed or when there is indication that exposures may have risen over PELs or published exposure levels since prior monitoring. Situations where it shall be considered whether the possibility that exposures have risen are as follows:

(A) When work begins on a different portion of the site.

(B) When contaminants other than those previously identified are being handled.

(C) When a different type of operation is initiated (e.g., drum opening as opposed to exploratory well drilling).

(D) When employees are handling leaking drums or containers or working in areas with obvious liquid contamination (e.g., a spill or lagoon).

(4) Monitoring of high-risk employees

After the actual clean-up phase of any hazardous waste operation commences; for example, when soil, surface water or containers are moved or disturbed; the employer shall monitor those employees likely to have the highest exposures to hazardous substances and health hazards likely to be present above PELs or published exposure levels by using personal sampling frequently enough to characterize employee exposures.

If the employees likely to have the highest exposure are over PELs or published exposure levels, then monitoring shall continue in order to identify all employees likely to be above those limits. The employer may utilize a representative sampling approach by documenting that the employees and chemicals chosen for monitoring are based on the criteria stated above.

Note to (h): It is not required to monitor employees engaged in site characterization operations covered by subsection (c) of this section.

(i) Informational Programs

Employers shall develop and implement a program, which is part of the employer's safety and health program required in subsection (b) of this section, to inform employees, contractors, and subcontractors (or their representatives) actually engaged in hazardous waste operations of the nature, level, and degree of exposure likely as a result of participation in such hazardous waste operations. Employees, contractors, and subcontractors working outside of the operations part of a site are not covered by this regulation.

California Specialized Training Institute, 2009

(j) Handling Drums and Containers

(1) General

(A) Hazardous substances and contaminated soils, liquids, and other residues shall be handled, transported, labeled, and disposed of in accordance with this subsection.

(B) Drums and containers used during the clean-up shall meet the appropriate U.S. Department of Transportation (DOT), OSHA, and EPA regulations for the wastes that they contain.

(C) When practical, drums and containers shall be inspected and their integrity shall be assured prior to being moved. Drums or containers that cannot be inspected before being moved because of storage conditions (i.e., buried beneath the earth, stacked behind other drums, stacked several tiers high in a pile, etc.) shall be moved to an accessible location and inspected prior to further handling.

(D) Unlabeled drums and containers shall be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled.

(E) Site operations shall be organized to minimize the amount of drum or container movement.

(F) Prior to movement of drums or containers, all employees exposed to the transfer operation shall be warned of the potential hazards associated with the contents of the drums or containers.

(G) U. S. Department of Transportation (DOT) specified salvage drums or containers and suitable quantities of proper absorbent shall be kept available and used in areas where spills, leaks, or ruptures may occur.

(H) Where major spills may occur, a spill containment program which is part of the employer's safety and health program required in subsection (b) of this section shall be implemented to contain and isolate the entire volume of the hazardous substance being transferred.

(I) Drums and containers that cannot be moved without rupture, leakage, or spillage shall be emptied into a sound container using a device classified for the material being transferred.

(J) A ground-penetrating system or other type of detection system or device shall be used to estimate the location and depth of buried drums or containers.

(K) Soil or covering material shall be removed with caution to prevent drum or container rupture.

(L) Fire extinguishing equipment meeting the requirements of 8 CCR, Ch. 4, Subch.7, Group 27 of the General Industry Safety Orders shall be on hand and ready for use to control incipient fires.

(2) Opening drums and containers

The following procedures shall be followed in areas where drums or containers are being opened:

California Specialized Training Institute, 2009

(A) Where an airline respirator system is used, connections to the bank of air cylinders shall be protected from contamination and the entire system shall be protected from physical damage.

(B) Employees not actually involved in opening drums or containers shall be kept a safe distance from the drums or containers being opened.

(C) If employees must work near or adjacent to drums or containers being opened, a suitable shield that does not interfere with the work operation shall be placed between the employee and the drums or containers being opened to protect the employee in case of accidental explosion.

(D) Controls for drum or container opening equipment, monitoring equipment, and fire suppression equipment shall be located behind the explosion-resistant barrier.

(E) When there is a reasonable possibility of flammable atmosphere being present, material handling equipment and hand tools shall be of the type to prevent sources of ignition.

(F) Drums and containers shall be opened in such a manner that excess interior pressure will be safely relieved. If pressure cannot be relieved from a remote location, appropriate shielding shall be placed between the employee and the drums or containers to reduce the risk of employee injury.

(G) Employees shall be instructed not to stand upon or work from drums or containers.

(3) Material handling equipment

Material handling equipment used to transfer drums and containers shall be selected, positioned and operated to minimize sources of ignition related to the equipment from igniting vapors released from ruptured drums or containers.

(4) Radioactive wastes

Drums and containers containing radioactive wastes shall not be handled until such time as their hazard to employees is properly assessed.

(5) Shock sensitive wastes

As a minimum, the following special precautions shall be taken when drums and containers containing or suspected of containing shock-sensitive wastes are handled:

(A) All non-essential employees shall be evacuated from the area of transfer.

(B) Material handling equipment shall be provided with explosive containment devices or protective shields to protect equipment operators from exploding containers.

(C) An employee alarm system capable of being perceived above surrounding light and noise conditions shall be used to signal the commencement and completion of explosive waste handling activities.

(D) Continuous communications (i.e., portable radios, hand signals, telephones, as appropriate) shall be maintained between the employee-in-charge of the immediate handling area and both the site safety and health supervisor and the command post until such time as the han-

California Specialized Training Institute, 2009

dling operation is completed. Communication equipment or methods that could cause shock sensitive materials to explode shall not be used.

(E) Drums and containers under pressure, as evidenced by bulging or swelling, shall not be moved until such time as the cause for excess pressure is determined and appropriate containment procedures have been implemented to protect employees from explosive relief of the drum.

(F) Drums and containers containing packaged laboratory wastes shall be considered to contain shock-sensitive or explosive materials until they have been characterized.

Caution: Shipping of shock sensitive wastes may be prohibited under U. S. Department of Transportation (DOT) regulations. Employers and shippers should refer to 49 CFR 173.21 and 173.50.

(6) Laboratory waste packs

In addition to the requirements of subsection (j)(5), the following precautions shall be taken, as a minimum, in handling laboratory waste packs (lab packs).

(A) Lab packs shall be opened only when necessary and then only by an individual knowledgeable in the inspection, classification, and segregation of the containers within the pack according to the hazards of the wastes.

(B) If crystalline material is noted on any container, the contents shall be handled as a shock-sensitive waste until the contents are identified.

(7) Sampling of drum and container contents

Sampling of containers and drums shall be done in accordance with a sampling procedure which is part of the site safety and health plan developed for and available to employees and others at the specific worksite.

(8) Shipping and transport

(A) Drums and containers shall be identified and classified prior to packaging for shipment.

(B) Drum or container staging areas shall be kept to the minimum number necessary to safely identify and classify materials and prepare them for transport.

(C) Staging areas shall be provided with adequate access and egress routes.

(D) Bulking of hazardous wastes shall be permitted only after a thorough characterization of the materials has been completed.

(9) Tank and vault procedures

(A) Tanks and vaults containing hazardous substances shall be handled in a manner similar to that for drums and containers, taking into consideration the size of the tank or vault.

(B) Appropriate tank or vault entry procedures as described in the employer's safety and health plan and meeting the requirements of 8 CCR, Ch. 4, Subch. 7, Article 108 of the General Industry Safety Orders shall be followed whenever employees must enter a tank or vault.

California Specialized Training Institute, 2009

(k) Decontamination

(1) General

Procedures for all phases of decontamination shall be developed and implemented in accordance with this subsection.

(2) Decontamination procedures

(A) A decontamination procedure shall be developed, communicated to employees, and implemented before any employees or equipment may enter areas on site where potential for exposure to hazardous substances exists.

(B) Standard operating procedures shall be developed to minimize employee contact with hazardous substances or with equipment that has contacted hazardous substances.

(C) All employees leaving a contaminated area shall be appropriately decontaminated; all contaminated clothing and equipment leaving a contaminated area shall be appropriately disposed of or decontaminated.

(D) Decontamination procedures shall be monitored by the site safety and health supervisor to determine their effectiveness. When such procedures are found to be ineffective, appropriate steps shall be taken to correct any deficiencies.

(3) Location

Decontamination shall be performed in geographical areas that will minimize the exposure of uncontaminated employees or equipment to contaminated employees or equipment.

(4) Equipment and solvents

All equipment and solvents used for decontamination shall be decontaminated or disposed of properly.

(5) Personal protective clothing and equipment

(A) Protective clothing and equipment shall be decontaminated, cleaned, laundered, maintained, or replaced as needed to maintain its effectiveness.

(B) Employees whose non-impermeable clothing becomes wetted with hazardous substances shall immediately remove that clothing and proceed to shower. The clothing shall be disposed of or decontaminated before it is removed from the work zone.

(6) Unauthorized employees

Unauthorized employees shall be instructed not to remove protective clothing or equipment from change rooms.

California Specialized Training Institute, 2009

(7) Commercial laundries or cleaning establishments

Commercial laundries or cleaning establishments that decontaminate protective clothing or equipment shall be informed of the potentially harmful effects of exposures to hazardous substances.

(8) Showers and change rooms

Where the decontamination procedure indicates a need for regular showers and change rooms outside of a contaminated area, they shall be provided and meet the requirements of 8 CCR, Ch. 4, Subch. 7, Article 9 of the General Industry Safety Orders. If temperature conditions prevent the effective use of water, then other effective means for cleansing shall be provided and used.

(l) Emergency Response by Employees at Uncontrolled Hazardous Waste Sites

(1) Emergency response plan

(A) An emergency response plan shall be developed and implemented by all employers within the scope of subsections (a)(1)(A)-(B) of this section to handle anticipated emergencies prior to the commencement of hazardous waste operations. The plan shall be in writing and available for inspection and copying by employees, their representatives, Division personnel, and other governmental agencies with relevant responsibilities.

(B) Employers who will evacuate their employees from the danger area when an emergency occurs, and who do not permit any of their employees to assist in handling the emergency, are exempt from the requirements of this subsection if they provide an emergency action plan complying with 8 CCR 3220 of the General Industry Safety Orders.

(2) Elements of an emergency response plan

The employer shall develop an emergency response plan for emergencies which shall address, as a minimum, the following:

(A) Pre-emergency planning.

(B) Personnel roles, lines of authority, and communication.

(C) Emergency recognition and prevention.

(D) Safe distances and places of refuge.

(E) Site security and control.

(F) Evacuation routes and procedures.

(G) Decontamination procedures which are not covered by the site safety and health plan.

(H) Emergency medical treatment and first aid.

(I) Emergency alerting and response procedures.

California Specialized Training Institute, 2009

(J) Critique of response and follow-up.

(K) Personal protective equipment (PPE) and emergency equipment.

(3) Procedures for handling emergency incidents

(A) In addition to the elements for the emergency response plan required in subsection (l)(2), the following elements shall be included for emergency response plans:

1. Site topography, layout, and prevailing weather conditions.
2. Procedures for reporting incidents to local, state, and federal governmental agencies.

(B) The emergency response plan shall be a separate section of the Site Safety and Health Plan.

(C) The emergency response plan shall be compatible and integrated with the disaster, fire and/or emergency response plans of local, state, and federal agencies.

(D) The emergency response plan shall be rehearsed regularly as part of the overall training program for site operations.

(E) The site emergency response plan shall be reviewed periodically and, as necessary, be amended to keep it current with new or changing site conditions or information.

(F) An employee alarm system shall be installed in accordance with 8 CCR, Ch. 4, Subch. 7, Article 165 of the General Industry Safety Orders to notify employees of an emergency situation, to stop work activities if necessary, to lower background noise in order to speed communication, and to begin emergency procedures.

(G) Based upon the information available at time of the emergency, the employer shall evaluate the incident and the site response capabilities and proceed with the appropriate steps to implement the site emergency response plan.

California Specialized Training Institute, 2009

(m) Illumination

Areas accessible to employees shall be lighted to not less than the minimum illumination intensities listed in Table H-1 while any work is in progress:

Table H-1 Minimum Illumination Intensity in Foot Candles	
Foot Candles	Area or Operations
5	General site areas.
3 active and	Excavation and waste areas, access ways, storage areas, loading platforms, refueling, field maintenance areas.
5 and	Indoors: Warehouses, corridors, hallways, and exitways.
5 work heading cap	Tunnels, shafts, and general underground areas. *(Exception:* minimum of 10-foot candles is required at tunnel and shaft during drilling, mucking, and scaling. Mine Safety and Health Administration approved lights shall be accepted for use in the tunnel heading.)
10 electrical barracks or dining	General shops (e.g., mechanical and equipment rooms, active storerooms, living quarters, locker or dressing room areas, and indoor toilets and workrooms.)
30	First aid stations, infirmaries, and offices.

(n) Sanitation at Temporary Workplaces

(1) Potable water

(A) An adequate supply of potable water shall be provided on the site.

(B) Portable containers used to dispense drinking water shall be capable of being tightly closed and equipped with a tap, and shall be otherwise designed, constructed, and serviced so that sanitary conditions are maintained. Water shall not be dipped from containers.

(C) Any container used to store, dispense, or distribute drinking water shall be clearly marked as to the nature of its contents and not used for any other purpose.

(D) Where single service cups (to be used but once) are supplied, both a sanitary container for the unused cups and a receptacle for disposing of the used cups shall be provided.

(2) Non-potable water

(A) Outlets for non-potable water, such as water for industrial or firefighting purposes, shall be identified to indicate clearly that the water is unsafe and is not to be used for drinking, washing, or cooking purposes.

California Specialized Training Institute, 2009

(B) There shall be no cross-connection, open or potential, between a system furnishing potable water and a system furnishing non-potable water.

(3) Toilet facilities

(A) A minimum of one separate toilet facility shall be provided for each 20 employees or fraction thereof of each sex. Such facilities may include both toilets and urinals provided that the number of toilets shall not be less than one half of the minimum required number of facilities.

Exception: Where there are less than 5 employees, separate toilet facilities for each sex are not required provided the toilet facilities can be locked from the inside and contain at least one toilet.

(B) Under temporary field conditions, provisions shall be made to assure that at least one toilet facility is available.

(C) Hazardous waste sites, not provided with a sanitary sewer, shall be provided with the following toilet facilities unless prohibited by local codes:

1. Chemical toilets;
2. Recirculating toilets;
3. Combustion toilets; or
4. Flush toilets.

(D) The requirements of this subsection for sanitation facilities shall not apply to mobile crews having transportation readily available to nearby toilet facilities.

(E) Doors entering toilet facilities shall be provided with entrance locks controlled from inside the facility.

(F) Toilet facilities shall be kept clean, maintained in good working order, and provided with an adequate supply of toilet paper.

(4) Food handling

All food service facilities and operations for employees shall meet the applicable laws, ordinances, and regulations of the jurisdictions in which they are located.

(5) Temporary sleeping quarters

When temporary sleeping quarters are provided, they shall be heated, ventilated, and lighted.

(6) Washing facilities

The employer shall provide adequate washing facilities for employees engaged in operations where hazardous substances may be harmful to employees. Such facilities shall be in near proximity to the worksite; in areas where exposures are below PELs and published exposure levels and which are under the control of the employer; and shall be so equipped as to enable employees to remove hazardous substances from themselves.

California Specialized Training Institute, 2009

(7) Showers and change rooms

When hazardous waste clean-up or removal operations commence on a site and the duration of the work will require six months or greater time to complete, the employer shall provide showers and change rooms for all employees exposed to hazardous substances and health hazards involved in hazardous waste clean-up or removal operations.

(A) Showers shall be provided and shall meet the requirements of 8 CCR 3366(f).

(B) Change rooms shall be provided and shall meet the requirements of 8 CCR 3367. Change rooms shall consist of two separate change areas separated by the shower area required in subsection (n)(7)(A) of this section. One change area, with an exit leading off the worksite, shall provide employees with a clean area where they can remove, store, and put on street clothing. The second area, with an exit to the worksite, shall provide employees with an area where they can put on, remove, and store work clothing and personal protective equipment.

(C) Showers and change rooms shall be located in areas where exposures are below the PELs and published exposure levels. If this cannot be accomplished, then a ventilation system shall be provided that will supply air that is below the PELs and published exposure levels.

(D) Employers shall assure that employees shower at the end of their work shift and when leaving the hazardous waste site.

(o) New Technology Programs

(1) Procedures for introduction

The employer shall develop and implement procedures for the introduction of effective new technologies and equipment developed for the improved protection of employees working with hazardous waste clean-up operations, and the same shall be implemented as part of the site safety and health program to assure that employee protection is being maintained.

(2) Evaluation

New technologies, equipment, or control measures available to the industry, such as the use of foams, absorbents, adsorbents, neutralizers, or other means to suppress the level of air contaminants while excavating the site or for spill control, shall be evaluated by employers or their representatives. Such an evaluation shall be done to determine the effectiveness of the new methods, materials, or equipment before implementing their use on a large scale for enhancing employee protection. Information and data from manufacturers or suppliers may be used as part of the employer's evaluation effort. Such evaluations shall be made available to the Division upon request.

(p) Certain Operations Conducted Under the Resource Conservation and Recovery Act of 1976 (RCRA)

Employers conducting operations at treatment, storage, and disposal (TSD) facilities specified in subsection (a)(1)(D) of this section shall provide and implement the programs specified

California Specialized Training Institute, 2009

in this subsection. (See the "Notes and Exceptions" to subsection (a)(2)(C) of this section for employers not covered.)

(1) Safety and health program

The employer shall develop and implement a written safety and health program for employees involved in hazardous waste operations that shall be available for inspection by employees, their representatives, and Division personnel. The program shall be designed to identify, evaluate, and control safety and health hazards in their facilities for the purpose of employee protection; to provide for emergency response meeting the requirements of subsection (p)(8) of this section; and to address as appropriate site analysis, engineering controls, maximum exposure limits, hazardous waste handling procedures, and uses of new technologies.

(2) Hazard communication program

The employer shall implement a hazard communication program meeting the requirements of 8 CCR 5194 as part of the employer's safety and health program.

Note to 8 CCR 5192: The exemption for hazardous waste provided in 8 CCR 5194 is applicable to this section.

(3) Medical surveillance program

The employer shall develop and implement a medical surveillance program meeting the requirements of subsection (f) of this section.

(4) Decontamination program

The employer shall develop and implement a decontamination procedure in accordance with subsection (k) of this section.

(5) New technology program

The employer shall develop and implement procedures meeting the requirements of subsection (o) of this section for introducing new and innovative equipment into the workplace.

(6) Material handling program

Where employees will be handling drums or containers, the employer shall develop and implement procedures meeting the requirements of subsections (j)(1)(B) through (H), and (K) of this section, as well as (j)(3) and (j)(8) of this section prior to starting such work.

(7) Training program

(A) New employees: The employer shall develop and implement a training program, which is part of the employer's safety and health program, for employees exposed to health hazards or hazardous substances at TSD operations to enable employees to perform their assigned duties and functions in a safe and healthful manner so as not to endanger themselves or other employees. The initial training shall be for 24 hours and refresher training shall be for eight hours annually. Employees who have received the initial training required by this subsection shall be given a written certificate attesting that they have successfully completed the necessary training.

California Specialized Training Institute, 2009

(B) Current employees: Employers who can show by an employee's previous work experience and/or training that the employee has had training equivalent to the initial training required by this subsection, shall be considered as meeting the initial training requirements of this subsection with respect to that employee. Equivalent training includes the training that existing employees might have already received from actual site work experience. Current employees shall receive eight hours of refresher training annually.

(C) Trainers: Trainers who teach initial training shall have satisfactorily completed a training course for teaching the subjects they are expected to teach, or they shall have the academic credentials and instruction experience necessary to demonstrate a good command of the subject matter of the courses and competent instructional skills.

(8) Emergency response program

(A) Emergency response plan: An emergency response plan shall be developed and implemented by all employers. Such plans need not duplicate any of the subjects fully addressed in the employer's contingency planning required by permits, such as those issued by the U. S. Environmental Protection Agency, provided that the contingency plan is made part of the emergency response plan. The emergency response plan shall be a written portion of the employer's safety and health program required in subsection (p)(1) of this section. Employers who will evacuate their employees from the worksite location when an emergency occurs and who do not permit any of their employees to assist in handling the emergency are exempt from the requirements of subsection (p)(8) if they provide an emergency action plan complying with 8 CCR 3220.

(B) Elements of an emergency response plan: The employer shall develop an emergency response plan for emergencies which shall address, as a minimum, the following areas to the extent that they are not addressed in any specific program required in this subsection:

1. Pre-emergency planning and coordination with outside parties.
2. Personnel roles, lines of authority, and communication.
3. Emergency recognition and prevention.
4. Safe distances and places of refuge.
5. Site security and control.
6. Evacuation routes and procedures.
7. Decontamination procedures.
8. Emergency medical treatment and first aid.
9. Emergency alerting and response procedures.
10. Critique of response and follow-up.
11. Personal protective equipment (PPE) and emergency equipment.

(C) Training.

California Specialized Training Institute, 2009

1. Training for emergency response employees shall be completed before they are called upon to perform in real emergencies. Such training shall include the elements of the emergency response plan, standard operating procedures the employer has established for the job, the PPE to be worn and procedures for handling emergency incidents.

   Exception #1: An employer need not train all employees to the degree specified if the employer divides the work force in a manner such that a sufficient number of employees who have responsibility to control emergencies have the training specified, and all other employees, who may first respond to an emergency incident, have sufficient awareness training to recognize that an emergency response situation exists and that they are instructed in that case to summon the fully trained employees and not attempt control activities for which they are not trained.

   Exception #2: An employer need not train all employees to the degree specified if arrangements have been made in advance for an outside fully-trained emergency response team to respond in a reasonable period and all employees, who may come to the incident first, have sufficient awareness training to recognize that an emergency response situation exists and they have been instructed to call the designated outside fully-trained emergency response team for assistance.

2. Employee members of TSD facility emergency response organizations shall be trained to a level of competence in the recognition of health and safety hazards to protect themselves and other employees. This would include training in the methods used to minimize the risk from safety and health hazards; in the safe use of control equipment; in the selection and use of appropriate personal protective equipment; in the safe operating procedures to be used at the incident scene; in the techniques of coordination with other employees to minimize risks; in the appropriate response to over- exposure from health hazards or injury to themselves and other employees; and in the recognition of subsequent symptoms which may result from over-exposures.

3. The employer shall certify that each covered employee has attended and successfully completed the training required in subsection (p)(8)(C) of this section, or shall certify the employee's competency at least yearly. The method used to demonstrate competency for certification of training shall be recorded and maintained by the employer.

(D) Procedures for handling emergency incidents.

1. In addition to the elements for the emergency response plan required in subsection (p)(8)(B) of this section, the following elements shall be included for emergency response plans to the extent that they do not repeat any information already contained in the emergency response plan:

   a. Site topography, layout, and prevailing weather conditions.

   b. Procedures for reporting incidents to local, state, and federal governmental agencies.

2. The emergency response plan shall be compatible and integrated with the disaster, fire and/or emergency response plans of local, state, and federal agencies.

California Specialized Training Institute, 2009

3. The emergency response plan shall be rehearsed regularly as part of the overall training program for site operations.
4. The site emergency response plan shall be reviewed periodically and, as necessary, be amended to keep it current with new or changing site conditions or information.
5. An employee alarm system shall be installed in accordance with 8 CCR 6184 to notify employees of an emergency situation; to stop work activities if necessary; to lower background noise in order to speed communication; and to begin emergency procedures.
6. Based upon the information available at time of the emergency, the employer shall evaluate the incident and the site response capabilities and proceed with the appropriate steps to implement the site emergency response plan.

(q) Emergency Response to Hazardous Substance Releases

This subsection covers employers whose employees are engaged in emergency response no matter where it occurs except that it does not cover employees engaged in operations specified in subsections (a)(1)(A) through (a)(1)(D) of this section. Those emergency response organizations who have developed and implemented programs equivalent to this subsection for handling releases of hazardous substances pursuant to Section 303 of the Superfund Amendments and Reauthorization Act of 1986 (Emergency Planning and Community Right-to-Know Act of 1986, 42 U.S.C. 11003) shall be deemed to have met the requirements of this subsection.

(1) Emergency response plan

An emergency response plan shall be developed and implemented to handle anticipated emergencies prior to the commencement of emergency response operations. The plan shall be in writing and available for inspection and copying by employees, their representatives, and Division personnel. Employers who will evacuate their employees from the danger area when an emergency occurs, and who do not permit any of their employees to assist in handling the emergency, are exempt from the requirements of this subsection if they provide an emergency action plan in accordance with 8 CCR 3220.

(2) Elements of an emergency response plan

The employer shall develop an emergency response plan for emergencies which shall address, as a minimum, the following to the extent that they are not addressed elsewhere:

(A) Pre-emergency planning and coordination with outside parties.

(B) Personnel roles, lines of authority, training, and communication.

(C) Emergency recognition and prevention.

(D) Safe distances and places of refuge.

(E) Site security and control.

(F) Evacuation routes and procedures.

California Specialized Training Institute, 2009

(G) Decontamination.

(H) Emergency medical treatment and first aid.

(I) Emergency alerting and response procedures.

(J) Critique of response and follow-up.

(K) Personal protective equipment (PPE) and emergency equipment.

(L) Emergency response organizations may use the local emergency response plan or the state emergency response plan or both, as part of their emergency response plan, to avoid duplication. Those items of the emergency response plan that are being properly addressed by the SARA Title III plans may be substituted into their emergency plan or otherwise kept together for the employer and employee's use.

(3) Procedures for handling emergency response

(A) The senior emergency response official who has ultimate site control responsibility shall confirm that the Incident Command System (ICS) is in place and the position of Incident Commander (IC) instituted.

All emergency responders and their communications shall be coordinated and controlled through the ICS.

Note to (q)(3)(A): The "senior official" at an emergency response is the most senior official on the site who has the responsibility for controlling the operations at the site until the emergency response official who is determined to have ultimate incident control authority arrives. Initially it is the senior officer on the first-due piece of responding emergency apparatus to arrive on the incident scene, usually a police or fire vehicle. As more senior officials arrive the position is passed up the line of authority which has been previously established. As there may be several separate spheres of responsibility at a given site (police, fire, CalTrans, for example), there may be several "senior officials," each responsible for his/her own employees. The "senior emergency response official" who will have ultimate site control responsibility is established in the Hazardous Material Incident Contingency Plan for the State of California (January 1991), promulgated by the State Office of Emergency Services (OES) as directed by Health and Safety Code, Sec. 25503 (HS 25503), and California Code of Regulations, Title 19, Division 2 (19 CCR, Div. 2: Office of Emergency Services) and in coordination with the various city and county (i.e., area emergency response plans).

(B) The individual in charge of the ICS shall identify, to the extent possible, all hazardous substances or conditions present and shall address as appropriate site analysis, use of engineering controls, maximum exposure limits, hazardous substance handling procedures, and use of any new technologies.

(C) Based on the hazardous substances and/or conditions present, the individual in charge of the ICS shall implement appropriate emergency operations, and assure that the PPE worn is appropriate for the hazards to be encountered. However, PPE shall meet, at a minimum, the criteria contained in 8 CCR 3401-3408 when worn while performing fire fighting operations beyond the incipient stage for any incident.

California Specialized Training Institute, 2009

(D) Employees engaged in emergency response and exposed to hazardous substances presenting an inhalation hazard or potential inhalation hazard shall wear positive pressure self-contained breathing apparatus (SCBA) while engaged in emergency response, until such time that the individual in charge of the ICS determines through the use of air monitoring that a decreased level of respiratory protection will not result in hazardous exposures to employees.

(E) The individual in charge of the ICS shall limit the number of emergency response personnel at the emergency site in those areas of potential or actual exposure to incident or site hazards, to those who are actively performing emergency operations. However, operations in hazardous areas shall be performed using the buddy system in groups of two or more.

(F) Back-up personnel shall stand by with equipment ready to provide assistance or rescue, and shall not engage in activities that will detract from that mission. Back-up personnel shall be protected, at a minimum, as the same level as the entry team. Advance first aid support personnel, at a minimum, shall also stand by with medical equipment and transportation capability.

(G) The individual in charge of the ICS shall designate a safety official, who is knowledgeable in the operations being implemented at the emergency response site, with specific responsibility to identify and evaluate hazards and to provide direction with respect to the safety of operations for the emergency at hand.

(H) When activities are judged by the safety official to be an IDLH condition 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 of any actions needed to be taken to correct these hazards at the emergency scene.

(I) After emergency operations have terminated, the individual in charge of the ICS shall implement appropriate decontamination procedures.

(J) When deemed necessary for meeting the tasks at hand, approved SCBA may be used with approved cylinders from other approved SCBA, provided that such cylinders are of the same capacity and pressure rating. All compressed air cylinders used with SCBA shall meet U. S. Department of Transportation (DOT) and National Institute for Occupational Safety and Health (NIOSH) criteria.

(4) Skilled support personnel

Personnel, not necessarily an employer's own employees, who are skilled in the operation of certain equipment, such as mechanized earth moving or digging equipment or crane and hoisting equipment, and who are needed temporarily to perform immediate emergency support work that cannot reasonably be performed in a timely fashion by an employer's own employees, and who will be or may be exposed to the hazards at an emergency response scene, are not required to meet the training required in this subsection for the employer's regular employees.

However, these personnel shall be given an initial briefing at the site prior to their participation in any emergency response. The initial briefing shall include instruction in the wearing of appropriate personal protective equipment, what chemical hazards are involved, and what duties

California Specialized Training Institute, 2009

are to be performed. All other appropriate safety and health precautions provided to the employer's own employees shall be used to assure the safety and health of these support personnel.

(5) Specialist employees

Employees who, in the course of their regular job duties, work with and are trained in the hazards of specific hazardous substances, and who will be called upon to provide technical advice or assistance at a hazardous substance release incident to the individual in charge, shall receive training or demonstrate competency in the area of their specialization annually.

(6) Training

Training shall be based on the duties and function to be performed by each responder of an emergency response organization. The skill and knowledge levels required for all new responders (those hired after the effective date of this standard) shall be conveyed to them through training before they are permitted to take part in actual emergency operations on an incident. Employees who participate, or are expected to participate, in emergency response, shall be given training in accordance with the following subsections:

(A) First Responder, Awareness Level (FRA): First responders at the awareness level are individuals who are likely to witness or discover a hazardous substance release and who have been trained to initiate an emergency response sequence by notifying the proper authorities of the release. They would take no further action beyond notifying the authorities of the release. First responders at the awareness level shall have sufficient training or have had sufficient experience to objectively demonstrate competency in the following areas:

1. An understanding of what hazardous substances are, and the risks associated with them in an incident.
2. An understanding of the potential outcomes associated with an emergency created when hazardous substances are present.
3. The ability to recognize the presence of hazardous substances in an emergency.
4. The ability to identify the hazardous substances, if possible.
5. An understanding of the role of the first responder awareness individual in the employer's emergency response plan (including site security and control), and the U. S. Department of Transportation's Emergency Response Guidebook.
6. The ability to realize the need for additional resources, and to make appropriate notifications to the communication center.

(B) First Responder, Operations Level (FRO): First responders at the operations level are individuals who respond to releases or potential releases of hazardous substances as part of the initial response to the site for the purpose of protecting nearby persons, property, or the environment from the effects of the release. They are trained to respond in a defensive fashion without actually trying to stop the release. Their function is to contain the release from a safe distance, keep it from spreading, and prevent exposures. First responders at the operational level shall have received at least eight hours of training or have had sufficient experience to objectively demon-

California Specialized Training Institute, 2009

strate competency in the following areas in addition to those listed for the awareness level; and the employer shall so certify:

1. Knowledge of the basic hazard and risk assessment techniques.
2. Know how to select and use proper PPE provided to the first responder operational level.
3. An understanding of basic hazardous materials terms.
4. Know how to perform basic control, containment, and/or confinement operations and rescue injured or contaminated persons within the capabilities of the resources and PPE available with their unit.
5. Know how to implement basic equipment, victim, and rescue personnel decontamination procedures.
6. An understanding of the relevant standard operating procedures and termination procedures.

(C) Hazardous Materials Technician: Hazardous materials technicians are individuals who respond to releases or potential releases of hazardous substances for the purpose of stopping the release. They assume a more aggressive role than a first responder at the operations level in that they will approach the point of release in order to plug, patch, or otherwise stop the release of a hazardous substance. Hazardous materials technicians shall have received at least 24 hours of training of which 8 hours shall be equivalent to the first responder operations level and in addition have competency in the following areas; and the employer shall so certify:

1. Know how to implement the employer's emergency response plan.
2. Know the classification, identification, and verification of known and unknown materials by using field survey instruments and equipment.
3. Be able to function within an assigned role in the ICS.
4. Know how to select and use proper specialized chemical PPE provided to the hazardous materials technician.
5. Understand hazard and risk assessment techniques.
6. Be able to perform advanced control, containment, and/or confinement operations and rescue injured or contaminated persons within the capabilities of the resources and PPE available with the unit.
7. Understand and implement equipment, victim, and rescue personnel decontamination procedures.
8. Understand termination procedures.
9. Understand basic chemical and toxicological terminology and behavior.

(D) Hazardous Materials Specialist: Hazardous materials specialists are individuals who respond with and provide support to hazardous materials technicians. Their duties parallel those of the hazardous materials technician, however, those duties require a more directed or specific

California Specialized Training Institute, 2009

knowledge of the various substances they may be called upon to contain. The hazardous materials specialist would also act as the site liaison with Federal, state, local, and other government authorities in regards to site activities. Hazardous materials specialists shall have received at least 24 hours of training equal to the technician level and in addition have competency in the following areas; and the employer shall so certify:

1. Know how to implement the local emergency response plan.
2. Understand classification, identification and verification of known and unknown materials by using advanced survey instruments and equipment.
3. Know of the state emergency response plan.
4. Be able to select and use proper specialized chemical PPE provided to the hazardous materials specialist.
5. Understand in-depth hazard and risk techniques.
6. Be able to perform specialized control, containment, and/or confinement operations within the capabilities of the resources and PPE available.
7. Be able to determine and implement decontamination procedures.
8. Have the ability to develop a site safety and health control plan.
9. Understand chemical, radiological, and toxicological terminology and behavior.

(E) Incident Commander/On-scene Manager: Incident commanders, who will assume control of the incident scene beyond the first responder awareness level, shall receive at least 24 hours of training equal to the first responder operations level and in addition have competency in the following areas; and the employer shall so certify:

1. Know and be able to implement the employer's incident command system.
2. Know how to implement the employer's emergency response plan.
3. Know and understand the hazards and risks associated with employees working in chemical protective clothing.
4. Know how to implement the local emergency response plan.
5. Know of the state emergency response plan and of the Federal Regional Response Team.
6. Know and understand the importance of decontamination procedures.

   Note to (q)(6)(E): Management personnel who, during an emergency situation, stay out of the hazardous area and who are not taking charge of the incident, and are not a "specialist" employee under subsection (q)(5) of this section are not subject to the provisions of this section.

(7) Trainers

Trainers who teach any of the above training subjects shall have satisfactorily completed a training course for teaching the subjects they are expected to teach, such as the courses offered

California Specialized Training Institute, 2009

by the California Specialized Training Institute, the California State Fire Marshal's Office, the University of California, or the U. S. National Fire Academy; or they shall have the training and/or academic credentials and instructional experience necessary to demonstrate competent instructional skills and a good command of the subject matter of the courses they are to teach.

(8) Refresher training

(A) Those employees who are trained in accordance with subsection (q)(6) of this section shall receive annual refresher training of sufficient content and duration to maintain their competencies, or shall demonstrate competency in those areas at least yearly.

(B) A statement shall be made of the training or competency; and if a statement of competency is made, the employer shall keep a record of the methodology used to demonstrate competency.

(9) Medical surveillance and consultation

(A) Members of an organized and designated HAZMAT team, and hazardous materials specialists shall receive a baseline physical examination and be provided with medical surveillance as required in subsection (f) of this section.

(B) Any emergency response employee who exhibits signs or symptoms which may have resulted from exposure to hazardous substances during the course of an emergency incident, either immediately or subsequently, shall be provided with medical consultation as required in subsection (f)(3)(B) of this section.

(10) Chemical protective clothing

Chemical protective clothing and equipment to be used by organized and designated HAZMAT team members, or to be used by hazardous materials specialists shall meet the requirements of subsections (g)(3) through (5) of this section.

(11) Post-emergency response operations

Upon completion of the emergency response, if it is determined that it is necessary to remove hazardous substances, health hazards, and materials contaminated with them (such as contaminated soil or other elements of the natural environment) from the site of the incident, the employer conducting the clean-up shall comply with one of the following:

(A) Meet all of the requirements of subsections (b) through (o) of this section; or

(B) Where the clean-up is done on plant property using plant or workplace employees, such employees shall have completed the training requirements of the following: 8 CCR 3220, 8 CCR 5144, 8 CCR 5194, and other appropriate safety and health training made necessary by the tasks that they are expected to perform such as the use of PPE, and decontamination procedures. All equipment to be used in the performance of the clean-up work shall be in serviceable condition and shall have been inspected prior to use.

Note: Authority cited: Sections 142.3 and 142.7, Labor Code. Reference: Sections 142.3 and 142.7, Labor Code.

California Specialized Training Institute, 2009

History

1. New section including Appendices A-D filed 8-26-91; operative 9-25-91 (Register 92, No. 12).

California Specialized Training Institute, 2009

Hazardous Waste Operations and Emergency Response

Note: The following appendices serve as non-mandatory guidelines to assist employees and employers in complying with the appropriate requirements of this section. However, subsection 5192(g) makes mandatory in certain circumstances the use of Level A and Level B PPE protection.

Personal Protective Equipment (PPE) Test Methods (Non-Mandatory)

This appendix sets forth the non-mandatory examples of tests which may be used to evaluate compliance with subsections (g)(4)(B) and (C). Other tests and other challenge agents may be used to evaluate compliance.

A. Totally-encapsulating chemical protective suit pressure test.

1.0—Scope

1.1 This practice measures the ability of a gas tight totally- encapsulating chemical protective suit material, seams, and closures to maintain a fixed positive pressure. The results of this practice allow the gas tight integrity of a totally-encapsulating chemical protective suit to be evaluated.

1.2 Resistance of the suit materials to permeation, penetration, and degradation by specific hazardous substances is not determined by this test method.

2.0—Definition of terms

2.1 "Totally-encapsulated chemical protective suit (TECP suit)" means a full body garment which is constructed of protective clothing materials; covers the wearer's torso, head, arms, legs and respirator; may cover the wearer's hands and feet with tightly attached gloves and boots; completely encloses the wearer and respirator by itself or in combination with the wearer's gloves and boots.

2.2 "Protective clothing material" means any material or combination of materials used in an item of clothing for the purpose of isolating parts of the body from direct contact with potentially hazardous liquid or gaseous chemicals.

2.3 "Gas tight" means, for the purpose of this test method, the limited flow of a gas under pressure from the inside of a TECP suit to atmosphere at a prescribed pressure and time interval.

3.0—Summary of test method

3.1 The TECP suit is visually inspected and modified for the test. The test apparatus is attached to the suit to permit inflation to the pre-test suit expansion pressure for removal of suit wrinkles and creases. The pressure is lowered to the test pressure and monitored for three minutes. If the pressure drop is excessive, the TECP suit fails the test and is removed from service. The test is repeated after leak location and repair.

4.0—Required supplies

California Specialized Training Institute, 2009

4.1 Source of compressed air.

4.2 Test apparatus for suit testing including a pressure measurement device with a sensitivity of at least 1/4 inch water gauge.

4.3 Vent valve closure plugs or sealing tape.

4.4 Soapy water solution and soft brush.

4.5 Stop watch or appropriate timing device.

5.0—Safety precautions

5.1 Care shall be taken to provide the correct pressure safety devices required for the source of compressed air used.

6.0—Test procedure

6.1 Prior to each test, the tester shall perform a visual inspection of the suit. Check the suit for seam integrity by visually examining the seams and gently pulling on the seams. Ensure that all air supply lines, fittings, visor, zippers, and valves are secure and show no signs of deterioration.

6.1.1 Seal off the vent valves along with any other normal inlet or exhaust points (such as umbilical air line fittings or face piece opening) with tape or other appropriate means (caps, plugs, fixture, etc.). Care should be exercised in the sealing process not to damage any of the suit components.

6.1.2 Close all closure assemblies.

6.1.3 Prepare the suit for inflation by providing an improvised connection point on the suit for connecting an airline. Attach the pressure test apparatus to the suit to permit suit inflation from a compressed air source equipped with a pressure indicating regulator. The leak tightness of the pressure test apparatus should be tested before and after each test by closing off the end of the tubing attached to the suit and assuring a pressure of three inches water gauge for three minutes can be maintained. If a component is removed for the test, that component shall be replaced and a second test conducted with another component removed to permit a complete test of the ensemble.

6.1.4 The pre-test expansion pressure (A) and the suit test pressure (B) shall be supplied by the suit manufacturer but in no case shall they be less than: (A) = 3 inches water gauge; and (B) = 2 inches water gauge. The ending suit pressure (C) shall be no less than 80 percent of the test pressure (B); i.e., the pressure drop shall not exceed 20 percent of the test pressure (B).

6.1.5 Inflate the suit until the pressure inside is equal to pressure (A), the pre-test expansion suit pressure. Allow at least one minute to fill out the wrinkles in the suit. Release sufficient air to reduce the suit pressure to pressure (B), the suit test pressure. Begin timing. At the end of three minutes, record the suit pressure as pressure (C), the ending suit pressure. The difference between the suit test pressure and the ending suit test pressure (B-C) shall be defined as the suit pressure drop.

6.1.6 If the suit pressure drop is more than 20 percent of the suit test pressure (B) during the three-minute test period, the suit fails the test and shall be removed from service.

California Specialized Training Institute, 2009

7.0—Retest procedure

7.1 If the suit fails the test, check for leaks by inflating the suit to pressure (A) and brushing or wiping the entire suit (including seams, closures, lens gaskets, glove-to-sleeve joints, etc.) with a mild soap and water solution. Observe the suit for the formation of soap bubbles, which is an indication of a leak. Repair all identified leaks.

7.2 Retest the TECP suit as outlined in Test Procedure 6.0.

8.0—Report

8.1 Each TECP suit tested by this practice shall have the following information recorded:

8.1.1 Unique identification number identifying brand name, date of purchase, material of construction, and unique fit features, e.g., special breathing apparatus.

8.1.2 The actual values for test pressures (A), (B), and (C) shall be recorded along with the specific observation times. If the ending pressure (C) is less than 80 percent of the test pressure (B), the suit shall be identified as failing the test. When possible, the specific leak location shall be identified in the test records. Retest pressure data shall be recorded as an additional test.

8.1.3 The source of the test apparatus used shall be identified and the sensitivity of the pressure gauge shall be recorded.

8.1.4 Records shall be kept for each pressure test even if repairs are being made at the test location.

Caution

Visually inspect all parts of the suit to be sure they are positioned correctly and secured tightly before putting the suit back into service. Special care should be taken to examine each exhaust valve to make sure it is not blocked.

Care should also be exercised to assure that the inside and outside of the suit is completely dry before it is put into storage.

B. Totally-encapsulated chemical protective suit qualitative leak test.

1.0—Scope

1.1 This practice semi-qualitatively tests gas tight totally- encapsulating chemical protective suit integrity by detecting inward leakage of ammonia vapor. Since no modifications are made to the suit to carry out this test, the results from this practice provide a realistic test for the integrity of the entire suit.

1.2 Resistance of the suit materials to permeation, penetration, and degradation is not determined by this test method. ASTM test methods are available to test suit materials for these characteristics and the tests are usually conducted by the manufacturers of the suits.

2.0—Definition of terms

2.1 "Totally-encapsulated chemical protective suit (TECP suit)" means a full body garment which is constructed of protective clothing materials; covers the wearer's torso, head, arms, legs

California Specialized Training Institute, 2009

and respirator; may cover the wearer's hands and feet with tightly attached gloves and boots; completely encloses the wearer and respirator by itself or in combination with the wearer's gloves and boots.

2.2 "Protective clothing material" means any material or combination of materials used in an item of clothing for the purpose of isolating parts of the body from direct contact with potentially hazardous liquid or gaseous chemicals.

2.3 "Gas tight" means, for the purpose of this test method, the limited flow of a gas under pressure from the inside of a TECP suit to atmosphere at a prescribed pressure and time interval.

2.4 "Intrusion Coefficient" means a number expressing the level of protection provided by a gas tight totally-encapsulating chemical protective suit. The intrusion coefficient is calculated by dividing the test room challenge agent concentration by the concentration of challenge agent found inside the suit. The accuracy of the intrusion coefficient is dependent on the challenge agent monitoring methods. The larger the intrusion coefficient the greater the protection provided by the TECP suit.

3.0—Summary of recommended practice

3.1 The volume of concentrated aqueous ammonia solution (ammonium hydroxide, NH4OH) required to generate the test atmosphere is determined using the directions outlined in 6.1. The suit is donned by a person wearing the appropriate respiratory equipment (either positive-pressure self-contained breathing apparatus or a positive-pressure supplied air respirator) and worn inside the enclosed test room. The concentrated aqueous ammonia solution is taken by the suited individual into the test room and poured into an open plastic pan. A two-minute evaporation period is observed before the test room concentration is measured using a high range ammonia length of stain detector tube. When the ammonia vapor reaches a concentration of between 1000 and 1200 ppm, the suited individual starts a standardized exercise protocol to stress and flex the suit. After this protocol is completed, the test room concentration is measured again. The suited individual exits the test room and his stand-by person measures the ammonia concentration inside the suit using a low range ammonia length of stain detector tube or other more sensitive ammonia detector.

A stand-by person is required to observe the test individual during the test procedure; aid the person in donning and doffing the TECP suit; and monitor the suit interior. The intrusion coefficient of the suit can be calculated by dividing the average test area concentration by the interior suit concentration. A colorimetric ammonia indicator strip of bromophenol blue or equivalent is placed on the inside of the suit face piece lens so that the suited individual is able to detect a color change and know if the suit has a significant leak. If a color change is observed the individual shall leave the test room immediately.

4.0—Required supplies

4.1 A supply of concentrated aqueous ammonium hydroxide (58% ammonia by weight).

4.2 A supply of bromophenol blue indicating paper or equivalent, sensitive to 5-10 ppm ammonia or greater over a two-minute period of exposure. (pH 3.0 (yellow) to pH 4.6 (blue))

California Specialized Training Institute, 2009

4.3 A supply of high range (0.5-10 volume percent) and low range (5-700 ppm) detector tubes for ammonia and the corresponding sampling pump. More sensitive ammonia detectors can be substituted for the low range detector tubes to improve the sensitivity of this practice.

4.4 A shallow plastic pan (PVC) at least 12":14":1" and a half pint plastic container (PVC) with tightly closing lid.

4.5 A graduated cylinder or other volumetric measuring device of at least 50 milliliters in volume with an accuracy of at least +1 milliliters.

5.0—Safety precautions

5.1 Concentrated aqueous ammonium hydroxide, NH4OH, is a corrosive volatile liquid requiring eye, skin, and respiratory protection. The person conducting the test shall review the MSDS for aqueous ammonia.

5.2 Since the established short term exposure limit (STEL) for ammonia is 35 ppm as a 15 minute STEL, only persons wearing positive pressure self-contained breathing apparatus or a positive pressure supplied air respirator shall be in the chamber. Normally only the person wearing the totally-encapsulating suit will be inside the chamber. A stand-by person shall have a positive pressure self-contained breathing apparatus, or a positive pressure supplied air respirator available to enter the test area should the suited individual need assistance.

5.3 A method to monitor the suited individual must be used during this test. Visual contact is the simplest but other methods using communication devices are acceptable.

5.4 The test room shall be large enough to allow the exercise protocol to be carried out and then to be ventilated to allow each exhaust of the ammonia test atmosphere after the test(s) are completed.

5.5 Individuals shall be medically screened for the use of respiratory protection and checked for allergies to ammonia before participating in this test procedure.

6.0—Test procedure

6.1.1 Measure the test area to the nearest foot and calculate its volume in cubic feet. Multiply the test area volume by 0.2 milliliters of concentrated aqueous ammonia solution per cubic foot of test area volume to determine the approximate volume of concentrated aqueous ammonia required to generate 1000 ppm in the test area.

6.1.2 Measure this volume from the supply of concentrated aqueous ammonia and place it into a closed plastic container.

6.1.3 Place the container, several high range ammonia detector tubes, and the pump in the clean test pan and locate it near the test area entry door so that the suited individual has easy access to these supplies.

6.2.1 In a non-contaminated atmosphere, open a pre-sealed ammonia indicator strip and fasten one end of the strip to the inside of suit face shield lens where it can be seen by the wearer. Moisten the indicator strip with distilled water. Care shall be taken not to contaminate the

California Specialized Training Institute, 2009

detector part of the indicator paper by touching it. A small piece of masking tape or equivalent should be used to attach the indicator strip to the interior of the suit face shield.

6.2.2 If problems are encountered with this method of attachment, the indicator strip can be attached to the outside of the respirator face piece lens being used during the test.

6.3 Don the respiratory protective device normally used with the suit, and then don the TECP suit to be tested. Check to be sure all openings which are intended to be sealed (zippers, gloves, etc.) are completely sealed. DO NOT, however, plug off any venting valves.

6.4 Step into the enclosed test room such as a closet, bathroom, or test booth, equipped with an exhaust fan. No air should be exhausted from the chamber during the test because this will dilute the ammonia challenge concentrations.

6.5 Open the container with the pre-measured volume of concentrated aqueous ammonia within the enclosed test room, and pour the liquid into the empty plastic test pan. Wait two minutes to allow for adequate volatilization of the concentrated aqueous ammonia. A small mixing fan can be used near the evaporation pan to increase the evaporation rate of the ammonia solution.

6.6 After two minutes a determination of the ammonia concentration within the chamber should be made using the high range colorimetric detector tube. A concentration of 1000 ppm ammonia or greater shall be generated before the exercises are started.

6.7 To test the integrity of the suit the following four-minute exercise protocol should be followed:

6.7.1 Raising the arms above the head with at least 15 raising motions completed in one minute.

6.7.2 Walking in place for one minute with at least 15 raising motions of each leg in a one-minute period.

6.7.3 Touching the toes with at least 10 complete motions of the arms from above the head to touching of the toes in a one-minute period.

6.7.4 Deep knee bends with at least 10 complete standing and squatting motions in a one-minute period.

6.8 If at any time during the test the colorimetric indicating paper should change colors, the test should be stopped and section 6.10 and 6.12 initiated. (See paragraph 4.2).

6.9 After completion of the test exercise, the test area concentration should be measured again using the high range colorimetric detector tube.

6.10 Exit the test area.

6.11 The opening created by the suit zipper or other appropriate suit penetration should be used to determine the ammonia concentration in the suit with the low range length of stain detector tube or other ammonia monitor. The internal TECP suit air should be sampled far enough from the enclosed test area to prevent a false ammonia reading.

California Specialized Training Institute, 2009

6.12 After completion of the measurement of the suit interior ammonia concentration the test is concluded and the suit is doffed and the respirator removed.

6.13 The ventilating fan for the test room should be turned on and allowed to run for enough time to remove the ammonia gas. The fan shall be vented to the outside of the building.

6.14 Any detectable ammonia in the suit interior (five ppm ammonia (NH3) or more for the length of stain detector tube) indicates that the suit has failed the test. When other ammonia detectors are used a lower level of detection is possible, and it should be specified as the pass/fail criteria.

6.15 By following this test method, an intrusion coefficient of approximately 200 or more can be measured with the suit in a completely operational condition. If the intrusion coefficient is 200 or more, then the suit is suitable for emergency response and field use.

7.0—Retest procedures

7.1 If the suit fails this test, check for leaks by following the pressure test in test A above.

7.2 Retest the TECP suit as outlined in the test procedure 6.0.

8.0—Report

8.1 Each gas tight totally-encapsulating chemical protective suit tested by this practice shall have the following information recorded.

8.1.1 Unique identification number identifying brand name, date of purchase, material of construction, and unique suit features (e.g., special breathing apparatus).

8.1.2 General description of test room used for test.

8.1.3 Brand name and purchase date of ammonia detector strips and color change data.

8.1.4 Brand name, sampling range, and expiration date of the length of stain ammonia detector tubes. The brand name and model of the sampling pump should also be recorded. If another type of ammonia detector is used, it should be identified along with its minimum detection limit for ammonia.

8.1.5 Actual test results shall list the two test area concentrations, their average, the interior suit concentration, and the calculated intrusion coefficient. Retest data shall be recorded as an additional test.

8.2 The evaluation of the data shall be specified as “suit passed” or “suit failed” and the date of the test. Any detectable ammonia (five ppm or greater for the length of stain detector tube) in the suit interior indicates the suit has failed this test. When other ammonia detectors are used, a lower level of detection is possible and it should be specified as the pass/fail criteria.

Caution

Visually inspect all parts of the suit to be sure they are positioned correctly and secured tightly before putting the suit back into service. Special care should be taken to examine each exhaust valve to make sure it is not blocked.

California Specialized Training Institute, 2009

Care should also be exercised to assure that the inside and outside of the suit is completely dry before it is put into storage.

California Specialized Training Institute, 2009

Appendix B

Note: The following appendices serve as non-mandatory guidelines to assist employees and employers in complying with the appropriate requirements of this section. However, subsection 5192(g) makes mandatory in certain circumstances the use of Level A and Level B PPE protection.

General Description and Discussion of the Levels of Protection and Protective Gear (Non-Mandatory)

This appendix sets forth information about personal protective equipment (PPE) protection levels which may be used to assist employers in complying with the PPE requirements of this section.

As required by the standard, PPE must be selected which will protect employees from the specific hazards which they are likely to encounter during their work on-site.

Selection of the appropriate PPE is a complex process which must take into consideration a variety of factors. Key factors involved in this process are identification of the hazards, or suspected hazards; their routes of potential hazard to employees (inhalation, skin absorption, ingestion, and eye or skin contact); and the performance of the PPE materials (and seams) in providing a barrier to these hazards. The amount of protection provided by PPE is material-hazard specific. That is, protective equipment materials will protect well against some hazardous substances and poorly, or not at all, against others. In many instances, protective equipment materials cannot be found which will provide continuous protection from the particular hazardous substance. In these cases the breakthrough time of the protective material should exceed the work durations.

Other factors in this selection process to be considered are matching the PPE to the employee's work requirements and task-specific conditions. The durability of PPE materials, such as tear strength and seam strength, should be considered in relation to the employee's tasks. The effects of PPE in relation to heat stress and task duration are a factor in selecting and using PPE. In some cases layers of PPE may be necessary to provide sufficient protection, or to protect expensive PPE inner garments, suits or equipment.

The more that is known about the hazards at the site, the easier the job of PPE selection becomes. As more information about the hazards and conditions at the site becomes available, the site supervisor can make decisions to upgrade or downgrade the level of PPE protection to match the tasks at hand.

The following are guidelines which an employer can use to begin the selection of the appropriate PPE. As noted above, the site information may suggest the use of combinations of PPE selected from the different protection levels (i.e., A, B, C, or D) as being more suitable to the hazards of the work. It should be cautioned that the listing below does not fully address the performance of the specific PPE material in relation to the specific hazards at the job site, and that PPE selection, evaluation, and re-selection is an ongoing process until sufficient information about the hazards and PPE performance is obtained.

California Specialized Training Institute, 2009

Part A

Personal protection equipment is divided into four categories based on the degree of protection afforded. (See Part B of this appendix for further explanation of Levels A, B, C, and D hazards):

I. Level A

To be selected when the greatest level of skin, respiratory, and eye protection is required.

The following constitute Level A equipment; it may be used as appropriate.

1. Positive-pressure, full face-piece, self-contained breathing apparatus (SCBA), or positive pressure supplied-air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH).
2. Totally-encapsulating chemical-protective suit.
3. Coveralls.*
4. Long underwear.*
5. Gloves, outer, chemical-resistant.
6. Gloves, inner, chemical-resistant.
7. Boots, chemical-resistant, steel toe and shank.
8. Hard hat (under suit).*
9. Disposable protective suit, gloves and boots (depending on suit construction, may be worn over totally-encapsulating suit.)

II. Level B

The highest level of respiratory protection is necessary but a lesser level of skin protection is needed.

The following constitute Level B equipment; it may be used as appropriate.

1. Positive-pressure, fullface-piece, self-contained breathing apparatus (SCBA), or positive-pressure supplied-air respirator with escape SCBA (NIOSH approved).
2. Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant overalls).
3. Coveralls.*
4. Gloves, outer, chemical-resistant.
5. Gloves, inner, chemical-resistant.
6. Boots, outer, chemical-resistant steel toe and shank.
7. Boot-covers, outer, chemical-resistant (disposable).*
8. Hard hat.*
9. Face shield.*

California Specialized Training Institute, 2009

III. Level C

The concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air purifying respirators are met.

The following constitute Level C equipment; it may be used as appropriate.

1. Full-face or half-mask, air-purifying respirators (NIOSH approved).
2. Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls).
3. Coveralls.*
4. Gloves, outer, chemical-resistant.
5. Gloves, inner, chemical-resistant.
6. Boots (outer), chemical-resistant steel toe and shank.*
7. Boot-covers, outer, chemical-resistant (disposable).*
8. Hard hat.*
9. Escape mask.*
10. Face shield.*

IV. Level D

A work uniform affording minimal protection; used for nuisance contamination only.

The following constitute Level D equipment; it may be used as appropriate.

1. Coveralls.
2. Gloves.*
3. Boots/shoes, chemical-resistant steel toe and shank.
4. Boots, outer, chemical-resistant (disposable).*
5. Safety glasses or chemical splash goggles.*
6. Hard hat.*
7. Escape mask.*
8. Face shield.*

* Optional, as applicable.

Part B

The types of hazards for which levels A, B, C, and D protection are appropriate are described below:

I. Level A

Level A protection should be used when:

California Specialized Training Institute, 2009

1. The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the skin.
2. Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible; or
3. Operations are being conducted in confined, poorly ventilated areas, and the absence of conditions requiring Level A have not yet been determined.

II. Level B

Level B protection should be used when:

1. The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection; and/or
2. The atmosphere contains less than 19.5 percent oxygen; or
3. The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin.

Note: This involves atmospheres with IDLH concentrations of specific substances that present severe inhalation hazards and that do not represent a severe skin hazard; or that do not meet the criteria for use of air-purifying respirators.

III. Level C

Level C protection should be used when:

1. The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin;
2. The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminants; and
3. All criteria for the use of air-purifying respirators are met.

IV. Level D

Level D protection should be used when:

1. The atmosphere contains no known hazard; and
2. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

Note: As stated before, combinations of personal protective equipment other than those described for Levels A, B, C, and D protection may be more appropriate and may be used to provide the proper level of protection.

California Specialized Training Institute, 2009

As an aid in selecting suitable chemical protective clothing, it should be noted that the National Fire Protection Association has developed standards on chemical protective clothing, including:

NFPA 1991—Standard on Vapor-Protective Suits for Hazardous Chemical Emergencies (EPA Level A Protective Clothing)

NFPA 1992—Standard on Liquid Splash-Protective Suits for Hazardous Chemical Emergencies (EPA Level B Protective Clothing)

NFPA 1993—Standard on Support Function Protective Garments for Hazardous Chemical Operations (EPA Level B Protective Clothing)

These standards apply documentation and performance requirements to the manufacture of chemical protective suits. Chemical protective suits meeting these requirements are labeled as compliant with the appropriate standard. As these standards, have been adopted by the National Fire Protection Association, it is recommended that chemical protective suits which meet these standards be used.

California Specialized Training Institute, 2009

Hazardous Waste Operations and Emergency Response

Note: The following appendices serve as non-mandatory guidelines to assist employees and employers in complying with the appropriate requirements of this section. However, subsection 5192(g) makes mandatory in certain circumstances the use of Level A and Level B PPE protection.

Compliance Guidelines (Non-Mandatory)

1. Occupational Safety and Health Program

Each hazardous waste site clean-up effort will require an occupational safety and health program headed by the site coordinator or the employer's representative. The purpose of the program will be the protection of employees at the site and will be an extension of the employer's overall safety and health program. The program will need to be developed before work begins on the site and implemented as work proceeds as stated in subsection (b). The program is to facilitate coordination and communication of safety and health issues among personnel responsible for the various activities which will take place at the site. The program will provide the means for identifying and controlling worksite hazards and the means for monitoring program effectiveness. It will provide the overall means for planning and implementing the needed safety and health training and job orientation of employees, who will be working at the site. The program will need to cover the responsibilities and authority of the site coordinator or the employer's manager on the site for the safety and health of employees at the site, and the relationships with contractors or support services as to what each employer's safety and health responsibilities are for their employees on the site. Each contractor on the site needs to have its own safety and health program so structured that it will smoothly interface with the program of the site coordinator or principal contractor.

Also those employers involved with treating, storing or disposal of hazardous waste as covered in subsection (p) must have implemented a safety and health program for their employees. This program is to include the hazard communication program required in subsection (p)(1) and the training required in subsections (p)(7) and (p)(8) as parts of the employer's comprehensive overall safety and health program. This program is to be in writing.

Each site or workplace safety and health program will need to include the following: (1) Policy statements of the line of authority and accountability for implementing the program, the objectives of the program, and the role of the site safety and health supervisor or manager and staff; (2) means or methods for the development of procedures for identifying and controlling workplace hazards at the site; (3) means or methods for the development and communication to employees of the various plans, work rules, standard operating procedures and practices that pertain to individual employees and supervisors; (4) means for the training of supervisors and employees to develop the needed skills and knowledge to perform their work in a safe and healthful manner; (5) means to anticipate and prepare for emergency situations; and (6) means for obtaining information feedback to aid in evaluating the program and for improving the

California Specialized Training Institute, 2009

effectiveness of the program. The management and employees should be trying continually to improve the effectiveness of the program thereby enhancing the protection being afforded those working on the site.

Accidents on the site should be investigated to provide information on how such occurrences can be avoided in the future. When injuries or illnesses occur on the site or workplace, they will need to be investigated to determine what needs to be done to prevent this incident from occurring again. Such information will need to be used as feedback on the effectiveness of the program and the information turned into positive steps to prevent any reoccurrence. Receipt of employee suggestions or complaints relating to safety and health issues involved with site or workplace activities is also a feedback mechanism that can be used effectively to improve the program and may serve in part as an evaluative tool(s).

For the development and implementation of the program to be the most effective, professional safety and health personnel should be used. Personnel such as, but not necessarily limited to Certified Safety Professionals, Board Certified Industrial Hygienists, or Registered Professional Safety Engineers are good examples of professional stature for safety and health managers who will administer the employer's program.

2. Training

The training programs for employees subject to the requirements of subsection (e) of this standard should address: The safety and health hazards employees should expect to find on hazardous waste clean-up sites; what control measures or techniques are effective for those hazards; what monitoring procedures are effective in characterizing exposure levels; what makes an effective employer's safety and health program; what a site safety and health plan should include; hands on training with personal protective equipment and clothing they may be expected to use; the contents of the OSHA standard relevant to the employee's duties and function; and employee's responsibilities under OSHA and other regulations. Supervisors will need training in their responsibilities under the safety and health program and its subject areas such as the spill containment program, the personal protective equipment program, the medical surveillance program, the emergency response plan, and other areas.

The training programs for employees subject to the requirements of subsection (p) of this standard should address: The employer's safety and health program elements impacting employees; the hazard communication program; the medical surveillance program; the hazards and the controls for such hazards that employees need to know for their job duties and functions. All require annual refresher training.

The training programs for employees covered by the requirements of subsection (q) of this standard should address those competencies required for the various levels of response such as: The hazards associated with hazardous substances; hazard identification and awareness; notification of appropriate persons; the need for and use of personal protective equipment including respirators; the decontamination procedures to be used; preplanning activities for hazardous substance incidents including the emergency response plan; company standard operating procedures for hazardous substance emergency responses; the use of incident command system; and other subjects. Hands-on training should be stressed whenever possible. Critiques done after an incident

California Specialized Training Institute, 2009

which include an evaluation of what worked and what did not, and how could the incident be better handled the next time may be counted as training time.

For hazardous materials specialists (usually members of hazardous materials teams), the training should address the care, use, and/or testing of chemical protective clothing including totally encapsulating suits; the medical surveillance program; the standard operating procedures for the hazardous materials team including the use of plugging and patching equipment; and other subject areas.

Officers and leaders who may be expected to be in charge at an incident should be fully knowledgeable of their company's incident command system. They should know where and how to obtain additional assistance and be familiar with the local district's emergency response plan and the state emergency response plan.

Specialist employees such as technical experts, medical experts, or environmental experts that work with hazardous materials in their regular jobs, who may be sent to the incident scene by the shipper, manufacturer, or governmental agency to advise and assist the person in charge of the incident should have training on an annual basis. Their training should include the care and use of personal protective equipment (PPE) including respirators; knowledge of the incident command system and how they are to relate to it; and those areas needed to keep them current in their respective field as it relates to safety and health involving specific hazardous substances.

Those skilled support personnel, such as employees who work for public works departments or equipment operators who operate bulldozers, sand trucks, backhoes, etc., who may be called to the incident scene to provide emergency support assistance, should have at least a safety and health briefing before entering the area of potential or actual exposure. These skilled support personnel, who have not been a part of the emergency response plan and do not meet the training requirements, should be made aware of the hazards they face and should be provided all necessary protective clothing and equipment required for their tasks.

There are two National Fire Protection Association standards, NFPA 472—Standard for Professional Competence of Responders to Hazardous Material Incidents and NFPA 471—Recommended Practice for Responding to Hazardous Material Incidents, which are excellent resource documents to aid fire departments and other emergency response organizations in developing their training program materials. NFPA 472 provides guidance on the skills and knowledge needed for first responder awareness level, first responder operations level, HAZMAT technicians, and HAZMAT specialists. It also offers guidance for the officer corps who will be in charge of hazardous substance incidents.

3. Decontamination

Decontamination procedures should be tailored to the specific hazards of the site and may vary in complexity and number of steps, depending on the level of hazard and the employee's exposure to the hazard. Decontamination procedures and PPE decontamination methods will vary depending upon the specific substance, since one procedure or method may not work for all substances. Evaluation of decontamination methods and procedures should be performed, as necessary, to assure that employees are not exposed to hazards by reusing PPE. References in

California Specialized Training Institute, 2009

Appendix D may be used for guidance in establishing an effective decontamination program. In addition, the U.S. Coast Guard's Manual, Policy Guidance for Response to Hazardous Chemical Releases, U.S. Department of Transportation, Washington, DC (COMDTINST M16465.30) is a good reference for establishing an effective decontamination program.

4. Emergency response plans

The state, along with designated districts within the state, will be developing or have developed local emergency response plans. These state and district plans should be utilized in the emergency response plans called for in this standard. Each employer should assure that its emergency response plan is compatible with the local plan. The major reference being used to aid in developing the state and local district plans is the Hazardous Materials Emergency Planning Guide, NRT-1.

The current Emergency Response Guidebook from the U.S. Department of Transportation, CMA's CHEMTREC, and the Fire Service Emergency Management Handbook may also be used as resources.

Employers involved with treatment, storage, and disposal facilities for hazardous waste, which have the required contingency plan called for by their permit, would not need to duplicate the same planning elements. Those items of the emergency response plan that are properly addressed in the contingency plan may be substituted into the emergency response plan required in 8 CCR 5192 or otherwise kept together for employer and employee use.

5. Personal protective equipment programs

The purpose of personal protective clothing and equipment (PPE) is to shield or isolate individuals from the chemical, physical, and biologic hazards that may be encountered at a hazardous substance site.

As discussed in Appendix B, no single combination of protective equipment and clothing is capable of protecting against all hazards. Thus PPE should be used in conjunction with other protective methods and its effectiveness evaluated periodically. The use of PPE can itself create significant worker hazards, such as heat stress, physical and psychological stress, and impaired vision, mobility, and communication. For any given situation, equipment and clothing should be selected that provide an adequate level of protection. However, over-protection, as well as under- protection, can be hazardous and should be avoided where possible.

Two basic objectives of any PPE program should be to protect the wearer from safety and health hazards, and to prevent injury to the wearer from incorrect use and/or malfunction of the PPE. To accomplish these goals, a comprehensive PPE program should include hazard identification; medical monitoring; environmental surveillance; selection, use, maintenance, and decontamination of PPE; and its associated training.

The written PPE program should include policy statements, procedures, and guidelines. Copies should be made available to all employees, and a reference copy should be made available at the worksite. Technical data on equipment, maintenance manuals, relevant regulations, and other essential information should also be collected and maintained.

California Specialized Training Institute, 2009

6. Incident command system (ICS)

Subsection 5192(q)(3)(B) requires the implementation of an ICS. The ICS is an organized approach to effectively control and manage operations at an emergency incident. The individual in charge of the ICS is the senior official responding to the incident. The ICS was originated by the California fire service. During large complex fires involving several companies and many pieces of apparatus, a command post would be established. This enabled one individual to be in charge of managing the incident, rather than having several officers from different companies making separate, and sometimes conflicting, decisions. The individual in charge of the command post would delegate responsibility for performing various tasks to subordinate officers. Additionally, all communications were routed through the command post to reduce the number of radio transmissions and eliminate confusion. However, strategy, tactics, and all decisions were made by one individual.

The ICS is also implemented for emergency response to all incidents, both large and small, that involve hazardous substances.

For a small incident, the individual in charge of the ICS may perform many tasks of the ICS. There may not be any, or little, delegation of tasks to subordinates. For example, in response to a small incident, the individual in charge of the ICS, in addition to normal command activities, may become the safety officer.

To illustrate the operation of the ICS, the following scenario might develop during a small incident, such as an overturned tank truck with a small leak of flammable liquid.

The first responding senior officer would implement and take command of the ICS. That person would size-up the incident and determine if additional personnel and apparatus were necessary; would determine what actions to take to control the leak; and determine the proper level of personal protective equipment. If additional assistance is not needed, the individual in charge of the ICS would implement actions to stop and control the leak using the fewest number of personnel that can effectively accomplish the tasks. The individual in charge of the ICS then would designate himself as the safety officer and two other employees as a back-up in case rescue may become necessary. In this scenario, decontamination procedures may not be necessary.

A large complex incident may require many employees and difficult, time-consuming efforts to control. In these situations, the individual in charge of the ICS will want to delegate different tasks to subordinates in order to maintain a span of control that will keep the number of subordinates that are reporting, to a manageable level.

Delegation of tasks at large incidents may be by location, where the incident scene is divided into sectors, and subordinate officers coordinate activities within the sector that they have been assigned.

Delegation of tasks can also be by function. Five major functional areas (Incident Command, Operations, Planning, Logistic, and Finance) are activated at major incidents addressing such issues as: medical services; evacuation; water supply; resources (equipment, apparatus); media relations; safety; and site control (integrate activities with police for crowd and traffic control). Also for a large incident, the individual in charge of the ICS will designate several employees

California Specialized Training Institute, 2009

as back-up personnel; and a number of safety officers to monitor conditions and recommend safety precautions.

Therefore, no matter what size or complexity an incident may be, by implementing an ICS there will be one individual in charge who makes the decisions and gives directions; and, all actions, and communications are coordinated through one central point of command. Such a system should reduce confusion, improve safety, organize and coordinate actions, and should facilitate effective management of the incident.

The details of the ICS as well as several different scenarios are incorporated into the California Hazardous Material Incident Contingency Plan (HMICP) developed by the State's Office of Emergency Services (OES). The HMICP is written primarily for agencies of the State of California to guide them in understanding the state's role in hazardous material emergencies. Secondarily, the HMICP is anticipated to be utilized by local and federal governments, and private organizations to clarify their roles and relationships concerning hazardous material emergencies. This plan should be used for pre-incident planning; or during a hazardous material emergency for guidance and clarification where a state agency has responsibility (i.e., State Agency Coordination) or jurisdiction (i.e., on the right of way of a state highway), or the incident exceeds local resources beyond those of the SARA Title III Regional Plan.

7. Site Safety and Control Plans

The safety and security of response personnel and others in the area of an emergency response incident site should be of primary concern to the incident commander. The use of a site safety and control plan could greatly assist those in charge of assuring the safety and health of employees on the site.

A comprehensive site safety and control plan should include the following: Summary analysis of hazards on the site and a risk analysis of those hazards; site map or sketch; site work zones (clean zone, transition or decontamination zone, work or hot zone); use of the buddy system; site communications; command post or command center; standard operating procedures and safe work practices; medical assistance and triage area; hazard monitoring plan (air contaminant monitoring, etc,); decontamination procedures and area; and other relevant areas. This plan should be a part of the employer's emergency response plan or an extension of it to the specific site.

8. Medical surveillance program

Workers handling hazardous substances may be exposed to toxic chemicals, safety hazards, biologic hazards, and radiation. Therefore, a medical surveillance program is essential to assess and monitor worker's health and fitness for employment in hazardous waste operations and during the course of work; to provide emergency and other treatment as needed; and to keep accurate records for future reference.

The Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities developed by the National Institute for Occupational Safety and Health (NIOSH), the Occupational Safety and Health Administration (Federal OSHA), the U.S. Coast Guard (USCG), and the Environmental Protection Agency (EPA), October 1985, provides an excel-

California Specialized Training Institute, 2009

lent example of the types of medical testing that should be done as part of a medical surveillance program.

9. New Technology and Spill Containment Programs

Where hazardous substances may be released by spilling from a container that will expose employees to the hazards of the material, the employer will need to implement a program to contain and control the spilled material. Diking and ditching, as well as use of absorbents like diatomaceous earth, are traditional techniques which have proven to be effective over the years. However, in recent years new products have come into the marketplace, the use of which complement and increase the effectiveness of these traditional methods. These new products also provide emergency responders and other with additional tools or agents to use to reduce the hazards of spilled materials.

These agents can be rapidly applied over a large area and can be uniformly applied or otherwise can be used to build a small dam, thus improving the workers' ability to control spilled material. These application techniques enhance the intimate contact between the agent and the spilled material allowing for the quickest effect by the agent or quickest control of the spilled material. Agents are available to solidify liquid spilled materials, to suppress vapor generation from spilled materials, and to do both. Some special agents, which when applied as recommended by the manufacturer, will react in a controlled manner with the spilled material to neutralize acids or caustics, or greatly reduce the level of hazard of the spilled material.

There are several modern methods and devices for use by emergency response personnel or others involved with spill control efforts to safely apply spill control agents to control spilled material hazards. These include portable pressurized applicators similar to hand-held portable fire extinguishing devices, and nozzle and hose systems similar to portable fire fighting foam systems which allow the operator to apply the agent without having to come into contact with the spilled material. The operator is able to apply the agent to the spilled material from a remote position.

The solidification of liquids provides for rapid containment and isolation of hazardous substance spills. By directing the agent at run-off points or at the edges of the spill, the reactant solid will automatically create a barrier to slow or stop the spread of the material. Clean-up of hazardous substances is greatly improved when solidifying agents, acid or caustic neutralizers, or activated carbon adsorbents are used. Properly applied, these agents can totally solidify liquid hazardous substances or neutralize or absorb them, which results in materials which are less hazardous and easier to handle, transport, and dispose of. The concept of spill treatment, to create less hazardous substances, will improve the safety and level of protection of employees working at spill clean-up operations or emergency response operations to spills of hazardous substances.

The use of vapor suppression agents for volatile hazardous substances, such as flammable liquids and those substances that present an inhalation hazard, is important for protecting workers. The rapid and uniform distribution of the agent over the surface of the spilled material can provide quick vapor knockdown. There are temporary and long-term foam-type agents that are effective on vapors and dusts, and activated carbon adsorption agents that are effective for vapor control and soaking-up of the liquid. The proper use of hose lines or hand-held portable pres-

California Specialized Training Institute, 2009

surized applicators provides good mobility and permits the worker to deliver the agent from a safe distance without having to step into the untreated spilled material. Some of these systems can be recharged in the field to provide coverage of larger spill areas than the design limits of a single charged applicator unit. Some of the more effective agents can solidify the liquid flammable hazardous substances and at the same time elevate the flashpoint above 14°F so the resulting substance may be handled as a nonhazardous waste material if it meets the U.S. Environmental Protection Agency's 40 CFR Part 261 requirements (See particularly § 261.21).

All workers performing hazardous substance spill control work are expected to wear the proper protective clothing and equipment for the materials present and to follow the employer's established standard operating procedures for spill control. All involved workers need to be trained in the established operating procedures; in the use and care of spill control equipment; and in the associated hazards and control of such hazards of spill containment work.

These new tools and agents are the things that employers will want to evaluate as part of their new technology program. The treatment of spills of hazardous substances or wastes at an emergency incident as part of the immediate spill containment and control efforts is sometimes acceptable to EPA and a permit exception is described in 40 CFR § 264.1(g)(8) and 265.1(c)(11).

California Specialized Training Institute, 2009

Appendix D

Hazardous Waste Operations and Emergency Response

Note: The following appendices serve as non-mandatory guidelines to assist employees and employers in complying with the appropriate requirements of this section. However, subsection 5192(g) makes mandatory in certain circumstances the use of Level A and Level B PPE protection.

References (Non-Mandatory)

The following references may be consulted for further information on the subject of this standard:

1. OSHA Instruction DFO CPL 2.70–January 29, 1986: Special Emphasis Program: Hazardous Waste Sites.
2. OSHA Instruction DFO CPL 2-2.37A–January 29, 1986: Technical Assistance and Guidelines for Superfund and Other Hazardous Waste Site Activities.
3. OSHA Instruction DTS CPL 2.74–January 29, 1986: Hazardous Waste Activity Form, OSHA 175.
4. Hazardous Waste Inspections Reference Manual; U.S. Department of Labor, Occupational Safety and Health Administration, 1986.
5. Memorandum of Understanding Among the National Institute for Occupational Safety and Health, the Occupational Safety and Health Administration, the United States Coast Guard, and the United States Environmental Protection Agency: Guidance for Worker Protection During Hazardous Waste Site Investigations and Clean-up and Hazardous Substance Emergencies, December 18, 1980.
6. National Priorities List, 1st Edition; October 1984; U.S. Environmental Protection Agency, revised periodically.
7. The Decontamination of Response Personnel; Field Standard Operating Procedures (F.S.O.P.) 7; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, December 1984.
8. Preparation of a Site Safety Plan; Field Standard Operating Procedures (F.S.O.P.) 9; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, April 1984.
9. Standard Operating Safety Guidelines; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, Environmental Response Team; November 1984.
10. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities; National Institute for Occupational Safety and Health (NIOSH), Occupational Safety

California Specialized Training Institute, 2009

and Health Administration (OSHA), U.S. Coast Guard (USCG), and Environmental Protection Agency (EPA); October 1985.

11. Protecting Health and Safety at Hazardous Waste Sites: An overview; U.S. Environmental Protection Agency, EPA/625/9-85/006; September 1985.
12. Hazardous Waste Sites and Hazardous Substance Emergencies; NIOSH Worker Bulletin, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health; December 1982.
13. Personal Protective Equipment for Hazardous Materials Incidents: A Selection Guide; U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health; October 1984.
14. Fire Service Emergency Management Handbook; International Association of Fire Chiefs Foundation, 101 East Holly Avenue, Unit 108, Sterling, VA 22170; January, 1985.
15. Emergency Response Guidebook; U.S. Department of Transportation, Washington, DC, 1990.
16. Report to the Congress on Hazardous Materials Training, Planning and Preparedness; Federal Emergency Management Agency, Washington, DC, July 1986.
17. Workbook for Fire Command; Alan V. Brunacini and J. David Beageron, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269, 1985.
18. Site Emergency Response Planning; Chemical Manufacturers Association, Washington, DC 20037, 1986.
19. Hazardous Materials Emergency Planning Guide; NRT-1, Environmental Protection Agency, Washington, DC, March 1987.
20. Community Teamwork: Working Together to Promote Hazardous Materials Transportation Safety; U.S. Department of Transportation, Washington, DC, May 1983.
21. Disaster Planning Guide for Business and Industry; Federal Emergency Management Agency, Publication No. FEMA 141, August 1987.
22. Hazardous Materials Medical Management Protocols; State Emergency Medical Services Authority, Publication #231, March 1989; 1030 15th Street, Suite 302, Sacramento, CA 95814.
23. Hazardous Material Incident Contingency Plan; Office of Emergency Services, Hazardous Materials Division, Sacramento; January 1991.
24. Hazardous Materials Handbook; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Note: Authority cited: Sections 142.3 and 142.7, Labor Code. Reference: Sections 142.3 and 142.7, Labor Code.

California Specialized Training Institute, 2009

Sample Standard Operating Procedure for Emergency Incident Rehabilitation

The United States Fire Administration (USFA), in an effort to reduce the incidence of emergency responder injury and death, has developed this sample Emergency Incident Rehabilitation Standard Operating Procedure (SOP). This SOP outlines the responsibilities of incident commanders, supervisors, and personnel; identifies the components of rehabilitation area establishment; and provides rehabilitation guidelines.

1. Purpose

To ensure that the physical and mental condition of members operating at the scene of an emergency or a training exercise does not deteriorate to a point that affects the safety of each member or that jeopardizes the safety and integrity of the operation.

2. Scope

This procedure shall apply to all emergency operations and training exercises where strenuous physical activity or exposure to heat or cold exists.

3. Responsibilities

Incident Commander

The Incident Commander shall consider the circumstances of each incident and make adequate provisions early in the incident for the rest and rehabilitation for all members operating at the scene. These provisions shall include: medical evaluation, treatment and monitoring; food and fluid replenishment; mental rest; and relief from extreme climatic conditions and the other environmental parameters of the incident. The rehabilitation shall include the provision of Emergency Medical Services (EMS) at the basic life support (BLS) level or higher.

California Specialized Training Institute, 2009

Supervisors

All supervisors shall maintain an awareness of the condition of each member operating within their span of control and ensure that adequate steps are taken to provide for each member's safety and health. The command structure shall be utilized to request relief and the reassignment of fatigued crews.

Personnel

During periods of hot weather, members shall be encouraged to drink water and activity beverages throughout the work day. During any emergency incident or training evolution, all members shall advise their supervisor when they believe that their level of fatigue or exposure to heat or cold is approaching a level that could affect themselves, their crew, or the operation in which they are involved. Members shall also remain aware of the health and safety of other members of their crew.

4. Establishment of Rehabilitation Sector

Responsibility

The Incident Commander will establish a Rehabilitation Sector or Group when conditions indicate that rest and rehabilitation is needed for personnel operating at an incident scene or training evolution. A member will be placed in charge of the sector/group and shall be known as the Rehab Officer. The Rehab Officer will typically report to the Logistics Officer in the framework of the incident management system.

Location

The location for the Rehabilitation Area will normally be designated by the Incident Commander. If a specific location has not been designated, the Rehab Officer shall select an appropriate location based on the site characteristics and designations below.

Site Characteristics

1. It should be in a location that will provide physical rest by allowing the body to recuperate from the demands and hazards of the emergency operation or training evolution.
2. It should be far enough away from the scene that members may safely remove their turnout gear and SCBA and be afforded mental rest from the stress and pressure of the emergency operation or training evolution.[1]
3. It should provide suitable protection from the prevailing environmental conditions. During hot weather, it should be in a cool, shaded area. During cold weather, it should be in a warm, dry area.

California Specialized Training Institute, 2009

4. It should enable members to be free of exhaust fumes from apparatus, vehicles, or equipment (including those involved in the Rehabilitation Sector/Group operations).
5. It should be large enough to accommodate multiple crews, based on the size of the incident.
6. It should be easily accessible by EMS units.
7. It should allow prompt reentry back into the emergency operation upon complete recuperation.

Site Designation

1. A nearby garage, building lobby, or other structure.
2. Several floors below a fire in a high rise building.
3. A school bus, municipal bus, or bookmobile.
4. Fire apparatus, ambulance, or other emergency vehicles at the scene or called to the scene.
5. Retired fire apparatus or surplus government vehicle that has been renovated as a Rehabilitation Unit. (This unit could respond by request or be dispatched during certain weather conditions.)
6. An open area in which a rehab Area can be created using tarps, fans, etc.

Resources

The Rehab Officer shall secure all necessary resources required to adequately staff and supply the Rehabilitation Area. The supplies should include the items listed below:

1. Fluids (water, activity beverage, oral electrolyte solutions, and ice)
2. Food (soup, broth, or stew in hot/cold cups)
3. Medical (blood pressure cuffs, stethoscopes, oxygen administration devices, cardiac monitors, intravenous solutions, and thermometers)
4. Other [awnings, fans, tarps, smoke ejectors, heaters, dry clothing, extra equipment, floodlights, blankets and towels, traffic cones, and fireline tape (to identify the entrance and exit of the rehabilitation area)]

5. Guidelines

Rehabilitation Sector/Group Establishment

Rehabilitation should be considered by staff officers during the initial planning stages of an emergency response. However, the climatic or environmental conditions of the emergency scene should not be the sole justification for establishing a rehabilitation area. Any activity/incident that is large in size, long in duration, and/or labor intensive will rapidly deplete the energy and strength of personnel and therefore merits consideration for rehabilitation.

California Specialized Training Institute, 2009

Climatic or environmental conditions that indicate the need to establish a Rehabilitation Area are a heat stress index above 90 F (see table 1-1)[2] or wind chill index below 10F (see table 1-2).[3]

Hydration

A critical factor in the prevention of heat injury is the maintenance of water and electrolytes. Water must be replaced during exercise periods and at emergency incidents. During heat stress, the member should consume at least one quart of water per hour. The re-hydration solution should be a 50/50 mixture of water and a commercially prepared activity beverage and administered at about 40 F.[4] Re-hydration is important even during cold weather operations where, despite the outside temperature, heat stress may occur during firefighting or other strenuous activity when protective equipment is worn. Alcohol and caffeine beverages should be avoided before and during heat stress because both interfere with the body's water conservation mechanisms.[5] Carbonated beverages should also be avoided.

Nourishment

The department shall provide food at the scene of an extended incident when units are engaged for three or more hours. A cup of soup, broth, or stew is highly recommended because it is digested much faster than sandwiches and fast-food products. In addition, foods such as apples, oranges, and bananas provide supplemental forms of energy replacement. Fatty and/or salty foods should be avoided.

Rest

The "two air bottle rule," or 45 minutes of work time, is recommended as an acceptable level prior to mandatory rehabilitation. Members shall re-hydrate (at least eight ounces) while SCBA cylinders are being changed. Firefighters having worked for two full 30-minute rated bottles, or 45 minutes, shall be immediately placed in the Rehabilitation Area for rest and evaluation. In all cases, the objective evaluation of a member's fatigue level shall be the criteria for rehab time. Rest shall not be less than ten minutes and may exceed an hour as determined by the Rehab Officer.[6] Fresh crews, or crews released from the Rehabilitation Sector/Group, shall be available in the Staging Area to ensure that fatigued members are not required to return to duty before they are rested, evaluated, and released by the Rehab Officer.

Recovery

Members in the Rehabilitation Area should maintain a high level of hydration, Members should not be moved from a hot environment directly into an air conditioned area because the body's cooling system can shut down in response to the external cooling. An air conditioned environment is acceptable after a cool-down period at ambient temperature with sufficient air movement. Certain drugs impair the body's ability to sweat and extreme caution must be exercised if the member has taken antihistamines, such as Actifed or Benadryl, or has taken diuretics or stimulants.

California Specialized Training Institute, 2009

Medical Evaluation

Emergency Medical Services (EMS)

EMS should be provided and staffed by the most highly trained and qualified EMS personnel on the scene (at a minimum of BLS level). They shall evaluate vital signs, examine members, and make proper disposition (return to duty, continued rehabilitation, or medical treatment and transport to medical facility). Continued rehabilitation should consist of additional monitoring of vital signs, providing rest, and providing fluids for re-hydration. Medical treatment for members whose signs and/or symptoms indicate potential problems, should be provided in accordance with local medical control procedures. EMS personnel shall be assertive in an effort to find potential medical problems early.

Heart Rate and Temperature

The heart rate should be measured for 30 seconds as early as possible in the rest period. If a member's heart rate exceeds 110 beats per minute, an oral temperature should be taken. If the member's temperature exceeds 100.6F, he/she should not be permitted to wear protective equipment. If it is below 100.6 F and the heart rate remains above 110 beats per minute, rehabilitation time should be increased. If the heart rate is less than 110 beats per minute, the chance of heat stress is negligible.[7]

Documentation

All medical evaluations shall be recorded on standard forms along with the member's name and complaints. In addition, all forms must be signed, dated and timed by the Rehab Officer or his/her designee.

Accountability

Members assigned to the Rehabilitation Sector/Group shall enter and exit the Rehabilitation Area as a crew. The crew designation, number of crew members, and the tunes of entry to and exit from the Rehabilitation Area shall be documented by the Rehab Officer or his/her designee on the Company Check-In/Check-Out Sheet. Crews shall not leave the Rehabilitation Area until authorized to do so by the Rehab Officer.

Footnotes

1 "Time Out for Rehab," Rekindle. July 1988, Vol. 1; Issue 7, pp. 15–16. Author Unknown.

2 Sachs, Gordon, "Heat Related Stress," Fairfax County Fire and Rescue Department, Safety Bulletin SB-87-08. June 1987. Attachment A.

3 Sachs, Gordon, "Cold Exposure Windchill," Fairfax County Fire and Rescue Department, Safety Bulletin SB-8801. January 1988. Attachment A.

4 Rose, Larry, "Drink and Thrive: A Study of On-scene Rehabilitation," Strategic Analysis of Fire Department Operations. September 1990. pp. 1–16.

California Specialized Training Institute, 2009

5 IAFF Department of Research, Health and Safety Division, "Thermal Stress and the Firefighter", ISBN 0-942920-04-X. 1982. pp.21–22.

6 Dodson, Dave, "Parker, Colorado Fire District Rehabilitation Plan," Health and Safety. December 1990.

7 Skinner, James, "Coping with Heat Stress on the Fireground. Fighting the Fire Within," Firehouse. August 1985. pp. 4648 and 66.

California Specialized Training Institute, 2009

United States Environmental Protection Agency
Office of Solid Waste and Emergency Response (5104)
EPA 550-F-00-009
July 2000
www.epa.gov/ceppo/

FIRST RESPONDERS' ENVIRONMENTAL LIABILITY DUE TO MASS DECONTAMINATION RUNOFF

The Environmental Protection Agency (EPA) is issuing this alert as part of its ongoing effort to provide information on environmental issues related to biological, chemical, and nuclear terrorist incidents. EPA publishes *Alerts* to increase awareness of possible hazards and environmental concerns. It is important that SERCs, LEPCs, emergency responders and others review this information and take appropriate steps to minimize risk.

PROBLEM

On April 19, 1999, the Team Leader of the Chemical Weapons Improved Response Team (CWIRT), U.S. Army Soldier and Biological Chemical Command sent a letter to EPA raising issues concerning first responders' liability during a weapons of mass destruction (WMD) terrorist incident. Specifically, the CWIRT asked about the first responders' liability for spreading contamination while attempting to save lives.

Environmental liability resulting from critical lifesaving actions may seem unlikely, but could be a serious concern for many first responders. The question is: Can emergency responders undertake necessary emergency actions in order to save-lives in dire situations without fear of environmental liability even when such emergency actions have unavoidable adverse environmental impacts? This concern is not limited to WMD terrorist incidents, it has broad implications for our National Response System (NRS) and frequently is discussed in the hazardous materials response community.

THE NERVE AGENT DRILL

The federal government recently sponsored a multi-agency drill based on a simulated nerve-agent attack. The release of the nerve agent resulted in hundreds of simulated casualties who survived the initial terrorist attack. The hazmat team had to rescue and decontaminate these "survivors" before they could receive medical attention. The hazmat team identified the need to collect the water used to decontaminate the victims (deconwater) to avoid a release to the environment. During the drill, these very capable, well-equipped, well-intentioned, professional hazmat teams delayed their initial entry for more than one hour, awaiting the arrival and set-up of pools to collect the deconwater. While the actor-survivors were dying a slow, painful, convulsive death, state and federal officials were debating and insisting that deconwater had to be collected for proper disposal. By the time the rescuers set up the holding pools and entered the site, nearly 90 minutes later, the "survivors"

had expired. The contaminated water was collected but the "victims" died.

GOOD SAMARITAN PROVISIONS

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Section § 107 (d) Rendering Care or Advice, addresses this issue. Section 107 (d) (1), often known as the "good Samaritan" provision states: "No person shall be liable under this sub chapter for costs or damages as a result of actions taken or omitted in the course of rendering care, assistance, or advice in accordance with the National Contingency Plan (NCP) or at the direction of an on-scene coordinator appointed under such plan, with respect to an incident creating a danger to public health or welfare or the environment as a result of any releases of a hazardous substance or the threat thereof." This provision does not preclude liability for costs or damages as a result of negligence. Releases of chemical and biological warfare agents due to a terrorist incident are considered hazardous materials incidents and therefore CERCLA §107 (d) (1) could apply, to the extent that there is a release or threatened release of a hazardous substance.

In addition, §107(d)(2) provides that state and local governments are not liable under CERCLA "as a result of actions taken in response to an emergency created by the release or threatened release of a hazardous substance generated by or from a facility owned by another person." Section 107(d)(2) would insulate state and local governments from potential CERCLA liability arising from first responder actions. **However, the provision does not apply to costs or damages caused by "gross negligence or intentional misconduct by the state or local government."**

During a hazardous materials incident (including a chemical/biological agent terrorist event), first responders should undertake any necessary emergency actions to save lives and protect the public and themselves. **Once any imminent threats to human health and live are addressed, first responders should immediately take all reasonable efforts to contain the contamination and avoid or mitigate environmental consequences.** EPA will not pursue enforcement actions against state and local responders for the environmental consequences of necessary and appropriate emergency response actions. First responders would not be protected under CERCLA from intentional contamination such as washing hazardous materials down the storm-sewer during a response action as an alternative to costly and problematic disposal or in order to avoid extra-effort**.**

OTHER LIABILITY ISSUES AND STATE TORT LAWS

EPA cannot prevent a private person from filing suit under CERCLA. However, first responders can use CERCLA's Good Samaritan provision as defenses to such an action. First responders could also be subject to actions under other laws, including state tort laws. A state's tort law allows individuals and businesses to seek compensation for losses or harm caused by another. The extent of tort liability of a state or local governmental jurisdiction, as well as individual employees or representatives of that jurisdiction, is established by the tort law of each state. The liability of governmental jurisdictions and their employees may be shaped by factors such as negligence, statutory and discretionary immunity, etc. **First responders should consult legal counsel in their state to discuss authority, status as an agent of the state, immunities, and indemnification.**

FEDERAL SUPPORT DURING A WMD INCIDENT

Contaminated runoff should be avoided whenever possible, but should not impede necessary and appropriate actions to protect human life and health. **Once the victims are removed and safe from further harm and the site is secured and stable, the first responders *should be doing everything reasonable to prevent further migration of contamination into the environment*.**

First responders should involve state and federal officials as soon as possible to reduce potential liability concerns. Under CERCLA, the Federal On-Scene Coordinator (FOSC) can determine which environmental regulations are applicable (or relevant and appropriate) to any removal response and may further determine that any such environmental regulation is impracticable to achieve depending on the exigencies of the situation. If the FOSC determines that it is impracticable to comply with any particular environmental regulation, then the responders (local, state, Federal or responsible party) do not have to comply with that particular environmental regulation. **By involving FOSC, first responders can substantially reduce their potential liability.**

In addition, FOSCs have an expanse of resources under the NRS to support state and local responders in determining a solution which best addresses protectiveness of human health and the environment. Under the NRC, the FOSC can provide invaluable assistance in determining clean-up and decontamination needs, health criteria and appropriate clean-up protocols as needed. FOSC support is even more critical in the aftermath of a WMD terrorist attack when critical post-emergency actions such as agent identification, crime scene sampling, crime scene preservation, and long-term risk evaluation are also being conducted.

PRE-PLANNING IS KEY!

It may not be technically feasible to contain all the runoff resulting from a WMD incident, but emergency responders may be able to reduce its impact to the environment by pre-planning. Responders can maximize local resources by using existing response mechanisms as much as possible. Local Emergency Planning Committees (LEPCs) are a good starting point. LEPCs are established under the Emergency Planning and Community Right-to-Know Act to develop local governments' emergency response and preparedness capabilities through better coordination and planning, especially within the local community. LEPCs include elected officials, police, fire, civil defense, public health professionals, environmental, hospital and transportation officials, who can work together creatively using available resources to minimize the environmental impact of WMD incidents.

For More Information.....

Contact the Emergency Planning and Community Right-to-Know Hotline

(800) 424-9346 or (703) 412-9810
TDD (800)553-7672

Monday -Friday, 9 AM to 6 PM, EASTERN TIME

Visit the **CEPPO Home Page on the World Wide Web at:**
http://www.epa.gov.ceppo/

Glossary

Glossary

Glossary of Terms: Hazardous Materials

The express purpose of this glossary of standardized terms is to provide common and readily understandable definitions for both hazardous materials emergency response and terrorism in order to facilitate communications and operations among emergency responders when dealing with hazardous materials incidents. **This document is not intended to be a legal or scientific reference.**

Abatement: The actions taken to reduce the amount, degree of the hazard, or intensity of the release or threatened release of a hazardous material.

Absorbent Material: A material designed to pick up and hold liquid hazardous material to prevent contamination spread.

Absorption: 1) The process of absorbing or "picking up" a liquid hazardous material to prevent enlargement of the contaminated area; 2) Movement of a toxicant into the circulatory system by oral, dermal, or inhalation exposure.

Acceptable Risk: A risk judged to be outweighed by corresponding benefits or one that is of such a degree that it is considered to pose minimal potential for adverse effects.

Access Control Point: The point of entry and exit that regulates traffic to and from control zones.

ACGIH: See American Conference of Governmental Industrial Hygienists.

Acid: A hydrogen-containing corrosive material that reacts with water to produce hydrogen ions; a proton donor.

Acute Effect: An adverse action on a human or animal, generally after a single significant exposure, which may be mild or severe. (See Chronic Effect.)

Acute Exposure: Exposure that is short in duration.

California Specialized Training Institute, 2009

Acute Release: Release of a hazardous material that is short in duration.

Acute Toxicity: Any harmful effect produced by a single short-term exposure that may result in severe biological harm or death.

Adjuvant: A substance used in pesticide formulation to aid its action. (Also used in the manufacture of drugs.)

Administering Agency (AA): The designated unit of a county or city tasked to administer the local implementation of the State and Federal hazardous material emergency planning and community right-to-know programs. Also known as Certified Uniform Program Agencies (CUPAs).

Adsorption: Process of adhering to a surface.

Aerosols: Liquid droplets, or solid particles dispersed in air, that are of fine enough particle size (0.01 to 100 microns) to remain dispersed for a period of time.

After Action Report: A post-incident analysis report generated by a responsible party or responding agency after termination of a hazardous material incident describing actions taken, materials involved, impacts, etc.

Agency Specific Plan: An emergency plan written by and addressing an individual agency's response actions, capabilities and resources.

AIHA: See American Industrial Hygiene Association.

Airborne Pollutants: Contaminants that are carried/released into the atmosphere or air.

Air Modeling: Mathematical models used to predict movement and concentrations of chemicals in the atmosphere.

Air Monitoring: To measure, record, and/or detect pollutants in ambient air.

Air Purifying Respirators (APR): Personal Protective Equipment; a breathing mask with specific chemical cartridges designed to either filter particulates or absorb contaminants before they enter the worker's breathing zone. They are intended to be used only in atmospheres where the chemical hazards and concentrations are known.

Air Purifying Respirator—powered: An APR with a portable motor to force air through the filtering/purifying cartridges for use only in atmospheres where the chemical hazards and concentrations are known.

Air Quality Management District: A local/regional air pollution agency responsible for regulation and monitoring of air quality.

Alkali: A hydroxide containing (-OH) corrosive material that is soluble in water, neutralizes acids, and is irritating or destructive to tissue.

Ambient Air Quality: Quality of the surrounding atmosphere or circulating air.

American Conference of Governmental Industrial Hygienists (ACGIH): A professional society of persons responsible for full-time industrial hygiene programs, who are employed by

California Specialized Training Institute, 2009

official governmental units. Its primary function is to encourage the interchange of experience among governmental industrial hygienists, and to collect and make available information of value to them. ACGIH promotes standards and techniques in industrial hygiene, and coordinates governmental activities with community agencies.

American Industrial Hygiene Association (AIHA): An organization of professionals trained in the recognition and control of health hazards and the prevention of illness related thereto. It promotes the study and control of environmental factors affecting the health of industrial workers, and provides information and communication services pertaining to industrial hygiene.

American National Standards Institute (ANSI): The Institute serves as a clearinghouse for nationally coordinated voluntary safety, engineering and industrial standards developed by industrial firms, trade associations, technical societies, consumer organizations, and government agencies.

American Society for Testing and Materials (ASTM): The Society establishes voluntary consensus standards for materials, products, systems, and services. Sponsors research projects, develops standard test methods, specifications, and recommended practices now in use.

Anhydrous: Free from water, dry.

Area Plan: A document established to facilitate emergency response to a release or threatened release of a hazardous material within a city or county. (California Health and Safety Code, Section 25503, Chapter 6.95)

Asbestos: A silicate of calcium or magnesium mineral, the friable form occurring in threadlike fibers; noncombustible and a nonconductor of electricity; a known carcinogen.

Asbestosis: A disease of the lungs caused by the inhalation of fine airborne fibers of asbestos.

Asphyxiant: A vapor or gas that can cause unconsciousness or death by suffocation (lack of oxygen).

Assessment: The process of determining the nature and degree of hazard of a hazardous material or hazardous materials incident.

Assisting Agencies: Any agency that assists the jurisdictional agency at the scene of a hazardous materials incident by providing a service or support not within the immediate responsibility or capability of the agency having jurisdiction. (Sacramento Fire Department HMRT)

Association of American Pesticide Control Officials, Inc.: This association consists of officials charged by law with active execution of the laws regulating the sale of economic poisons, and of deputies designated by these officials employed by State, Territorial, dominion, or Federal agencies.

Association of American Railroads: A central coordinating and research agency of the American railway industry.

Authority Having Jurisdiction: 1) Provides for the position of Incident Commander at the scene of a hazardous materials incident occurring within their jurisdictional authority

California Specialized Training Institute, 2009

boundaries. 2) The organization, office, or individual responsible for approving the equipment, an installation, or a procedure. (NFPA)

Base (Chemical): A hydroxide containing (-OH) corrosive material that when in a water solution is bitter, more or less irritating, or caustic to the skin.

Base (ICS): The location at which the primary logistics functions are coordinated and administered. The ICS may be collocated with the ICP.

Bioassay: Determination of the relative strength and toxicity of a substance (such as a drug) by comparing its effect on a test organism with that of a standard preparation.

Bioaccumulation: Absorption and storage of toxic chemicals from the environment in an organism, usually in body fat.

Biohazard: Infectious agents presenting a risk or potential risk to living organisms, either directly through infection or indirectly through disruption of the environment.

Biohazard Area: Any area in which work has been, or is being performed, with infectious agents or materials.

Biological Agents: Biological materials those are capable of causing acute or long-term damage to living organisms. (NFPA 1990, 1-3)

Biological Half-Life: The time required for a living organism to eliminate half of a substance which it takes in.

Biological Treatment: A process by which waste is rendered less hazardous, or is reduced in volume, by relying on the action of microorganisms.

Blasting Agent: A material designed for blasting which has been tested and found to be so insensitive that there is very little probability of accidental initiation to explosion or of transition from deflagration to detonation.

Boiling Liquid Expanding Vapor Explosion (BLEVE): A container failure with a release of energy, often rapidly and violently, which is accompanied by a release of gas to the atmosphere and propulsion of the container or container pieces due to an overpressure rupture.

Boom: A floating physical barrier serving as a continuous obstruction to the spread of a contaminant.

Bootie: A sock like over-boot protector worn to minimize contamination.

Breakthrough Time: The elapsed time between initial contact of the hazardous chemical with the outside surface of a barrier, such as protective clothing material, and the time at which the chemical can be detected at the inside surface of the material.

Breathing Zone Air Sample: A sample collected in the breathing area of a worker to assess exposure to airborne contaminants.

Buddy System: A system of organizing employees into work groups in such a manner that each employee of the work group is designated to be observed by at least one other employee in the work group. [8 CCR 5192 (a)(3)]

California Specialized Training Institute, 2009

Buffer Zone: The area of land that surrounds a hazardous waste facility on which certain usages and activities are restricted to protect the public health and safety, and the environment from existing or potential hazards caused by the migration of hazardous waste.

Bureau of Alcohol, Tobacco and Firearms (ATF): The Federal bureau that enforces and administers firearms and explosive laws, as well as those covering the production, use and distribution of alcohol and tobacco products.

Business Plan: A written plan and inventory developed by a business for each facility, site, or branch that provides emergency response guidelines for a release of hazardous materials meeting the requirements of H&SC 25504.

California Accidental Release Prevention Program (CalARP): The California Accidental Release Prevention (CalARP) Program is the federal Accidental Release Prevention (ARP) Program with some state specific requirements. On January 1, 1997, Chapter 6.95, Sections 25531 to 25545.3 HSC repealed statutes for California's former Risk Management and Prevention (RMPP) Program and mandated the new CalARP program.

California Air Resources Board (ARB): The State board that enforces and implements California and Federal air pollution control laws.

California Department of Fish and Game (DFG): The State department which enforces provisions of the State Fish and Game Code that prohibits pollution of habitats, waters and ocean waters; and acts as the State Liaison Officer at major off highway hazardous materials incidents.

California Department of Forestry and Fire Protection (CDF): A State resources department that protects unincorporated lands from wildfire and responds to public safety emergencies.

California Department of Health Services (DHS): The State department containing the Radiological Health Branch, Office of Drinking Water and Office of Risk Assessment in addition to medical and health services.

California Department of Toxic Substances Control (DTSC): The State department responsible for regulation of storage, transport, treatment, and disposal of hazardous waste; and oversight of remediation and long-term clean up of sites contaminated with hazardous substance.

California Department of Transportation (Caltrans): The State department responsible for planning, designing, constructing, operating, and maintaining the State's highway system. It will ensure, in cooperation with other public and private agencies, the identification and containment of hazardous materials and restoration of orderly traffic flow. It will contract with cleanup companies to assist with cleanup.

California Division of Occupational Safety and Health (Cal/OSHA): The State division responsible for enforcement of worker safety laws.

California Environmental Protection Agency (Cal/EPA): The State agency consisting of the Departments of Toxic Substances Control and Pesticide Regulation, the Office of Environmental Health Hazard Assessment, the Department of Water Resources and Regional Water Quality Control Boards, the Air Resources Board and the Integrated Waste Management Board. Cal/EPA sets the policy and direction that the member organizations pursue.

California Specialized Training Institute, 2009

California Fire Mutual Aid Plan: A pre-plan agreement comprised of fire jurisdictions within the State of California to respond and assist in the event of any incident that has been determined to be outside the local fire jurisdiction's capabilities.

California Hazardous Materials Incident Reporting System (CHMIRS): A mandatory post-incident reporting system to collect statistical data on hazardous material incidents in California. This data includes a description of the disaster, the location, the time and date, the state and local agencies responding, the actions taken by the agencies, and the agency, which had primary authority for responding to the disaster. (Chapter 6.95 of the Health and Safety Code, Title 19 CCR, and Government Code Section 8574.8 (d))

California Highway Patrol (CHP): The State agency with primary responsibility for traffic supervision and control on all State highways constructed as freeways, all State-owned vehicular crossings, and on most State and county highways and roadways in unincorporated areas of the State. The department enforces hazardous materials transportation laws and acts as Incident Commander, Liaison Officer, and the Statewide information, assistance, and notification coordinator for all hazardous materials incidents within its jurisdiction.

California Law Enforcement Mutual Aid Plan: Establishes the State policy for law enforcement mutual aid and outlines the procedures for coordination of alerting, dispatching, and utilization of law enforcement personnel and equipment resources.

California Office of Emergency Services (OES): The State agency responsible for administration of Health and Safety Code Chapter 6.95 and Title 19 CCR, and development of Statewide disaster response plans, and coordination of Statewide mutual aid.

California Specialized Training Institute (CSTI): The organization within the Governor's Office of Emergency Services with the responsibility to standardize curriculum and certify instructors, students, and classes in the area of hazardous materials emergency response for the public and private sectors.

California State Emergency Plan: The document established pursuant to Section 8568 of the California Government Code that addresses the State's response to extraordinary emergency situations associated with natural disasters, technological incidents, and war emergency operations.

California State Fire Marshal (SFM): A division of the Department of Forestry and Fire Protection for the safety of all interstate and intrastate hazardous liquid pipelines in California.

Canadian Transport Emergency Center (CANUTEC): A 24 hour, government sponsored hot line for chemical emergencies (the Canadian version of CHEMTREC.)

Carboy: A container, usually encased in a protective basket or crate, used to ship hazardous materials, particularly corrosives.

Carcinogen: An agent that produces or is suspected of producing cancer. (FEMA HMCP)

Cascade System: Several air cylinders attached in series to fill Self Contained Breathing Apparatus (SCBA) bottles.

California Specialized Training Institute, 2009

Catastrophic Incident: An event that significantly exceeds the resources of a jurisdiction.

Cease and Desist Order: Legal direction to stop any and all activities.

Celsius (Centigrade) C: The internationally used scale for measuring temperature, in which 100o is the boiling point of water at sea level (1 atmosphere), and 0o is the freezing point.

Center for Disease Control (CDC): The federally funded research organization tasked with disease control and research.

California Environmental Quality Act (CEQA): The law that may require Environmental Impact Reports (EIRs) at sites where significant activities occur.

Certified employee: An employee that has completed all of the requirements for training certification delineated in subsection (e)(6) of this section.

Certified supervisor: A supervisor that has completed all of the requirements for training certification delineated in subsection (e)(6) of this section.

CFR: 1) Crash, Fire, Rescue personnel; trained in aircraft fire fighting and rescue; 2) Code of Federal Regulations; enforced by federal and state agencies and contains roles for the function of federal government.

CGA: See Compressed Gas Association.

Chemical Abstracts Service (CAS) Number: A numbering system assigned by the American Chemical Society often used by local and State hazardous materials compliance legislation for tracking chemicals in the workplace and in the community.

Chemical Hazards Response Information System/Hazard Assessment Computer System (CHRIS/HACS): Developed by the Coast Guard, HACS is a computerized model of the CHRIS manuals (containing chemical-specific data), and is used by Federal on-scene coordinators during a chemical spill/response.

Chemical Manufacturers Association (CMA): The parent organization that operates CHEMTREC.

Chemical Protective Clothing Material: Any material or combination of materials used in an item of clothing for the purpose of isolating parts of the wearer's body from contact with a hazardous chemical. (NFPA 1991,1-3)

Chemical Protective Suit: Single or multi-piece garment constructed of chemical protective clothing materials designed and configured to protect the wearer's torso, head, arms, legs, hands, and feet. (NFPA 1991, 1-3)

Chemical Resistance: The ability to resist chemical attack. The attack is dependent on the method of test and its severity is measured by determining the changes in physical properties. Time, temperature, stress, and reagent may all be factors that affect the chemical resistance of a material.

California Specialized Training Institute, 2009

Chemical Resistant Materials: Materials that are specifically designed to inhibit or resist the passage of chemicals into and through the material by the processes of penetration, permeation or degradation.

Chemical Transportation Emergency Center (CHEMTREC): The Chemical Transportation Center, operated by the Chemical Manufacturers Association (CMA), can provide information and technical assistance to emergency responders. [Phone number (800) 424-9300]

Chemnet: A mutual aid network of chemical shippers and contractors. It is activated when a member shipper cannot respond promptly to an incident involving chemicals. (Contact is made through CHEMTREC.)

Chlorep: The chlorine emergency plan, established by the Chlorine Institute, enables the nearest producer of chlorine to respond to an incident involving chlorine. (Contact is made through CHEMTREC.)

Chlorine Kits: Standardized kits commercially manufactured by contract with the Chlorine Institute to provide equipment to control or stop leaks in chlorine cylinders, tanks, and transportation tank cars.

Chronic Effect: Delayed or slowly developing harm resulting from a chemical exposure, which is often hard to recognize.

Clandestine Laboratory: An operation consisting of a sufficient combination of apparatus and chemicals that either have been or could be used in the illegal manufacture/synthesis of controlled substances.

Clean Air Act: A set of national standards for ambient air quality that defines the principal types and levels of pollution that should not be exceeded. This law requires States to develop "State implementation plans" for achieving the ambient air standards in each air quality control region in the State.

Cleanup: Incident scene activities directed toward removing hazardous materials, contamination, debris, damaged containers, tools, dirt, water, and road surfaces in accordance with proper and legal standards, and returning the site to as near a normal state as existed prior to the incident. (Sacramento Fire Department HMRT)

Cleanup Company (Hazardous Waste): A commercial business entity available for hire to specifically remove, transport, and/or dispose of hazardous wastes; and when appropriate, must meet California Highway Patrol and Department of Toxic Substances Control requirements.

Cleanup Operation: An operation where hazardous substances are removed, contained, incinerated, neutralized, stabilized, cleared up, or in any other manner processed or handled with the ultimate goal of making the site safer for people or the environment. (8 CCR 5192(a)(3))

Clean Water Act (CWA): Federal legislation to protect the nation's water and set State water quality standards for interstate navigable waters as the basis for pollution control and enforcement. The main objective is to restore and maintain the chemical, physical and biological integrity of the Nation's waters.

California Specialized Training Institute, 2009

Cold Zone: The area outside of the warm zone. Equipment and personnel are not expected to become contaminated in this area. This is the area where resources are assembled to support the hazardous materials operation.

Colorimetric Tubes: Glass tubes containing a chemically treated substrate that reacts with specific airborne chemicals to produce a distinctive color. The tubes are calibrated to indicate approximate concentrations in air.

Combined Liquid Waste Sampler (COLIWASSA): A tool designed to provide stratified sampling of a liquid container.

Combustibility: The ability of a substance to undergo rapid chemical combination with oxygen, with the evolution of heat.

Combustible Liquid: Liquids with a flashpoint above 100o F. (49 CFR 173.120 (b)(2).)

Combustion Product: By-products produced or generated during the burning or oxidation of a fuel.

Command: The act of directing, ordering, and/or controlling resources by virtue of explicit legal, agency, or delegated authority. (NIIMS)

Command Post: The location from which the primary command functions are executed, usually co-located with the incident base.

Community Awareness and Emergency Response (CAER): A program developed by the Chemical Manufacturers Association (CMA) to provide guidance for chemical plant managers to assist them in taking the initiative in cooperating with local communities developing integrated hazardous materials response plans.

Community Right-to-Know: Legislation requiring business establishments to provide chemical inventory information to local agencies or the public.

Company (Fire Usage): Any piece of fire response equipment having a full complement of personnel. (NIIMS)

Compatibility: The matching of protective chemical clothing to the hazardous material involved to provide the best protection for the worker.

Compatibility Charts: Permeation and penetration data supplied by manufacturers of chemical protective clothing to indicate chemical resistance and breakthrough time of various garment materials as tested against a battery of chemicals. This test data should be in accordance with ASTM and NFPA standards.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): Known as CERCLA or SUPERFUND, it addresses hazardous substance releases into the environment and the cleanup of inactive hazardous waste sites. It also requires those who release hazardous substances, as defined by the Environmental Protection Agency (EPA), above certain levels (known as "reportable quantities") to notify the National Response Center.

Compressed Gas: Any material or mixture having an absolute pressure exceeding 40 p.s.i. in the container at 70ºF or, regardless of the pressure at 70ºF, having an absolute pressure exceed-

California Specialized Training Institute, 2009

ing 104 p.s.i. at 130ºF; or any liquid flammable material having a vapor pressure exceeding 40 p.s.i. absolute at 100ºF as determined by testing. Also includes cryogenic or "refrigerated liquids" (DOT) with boiling points lower than-130ºF at 1 atmosphere.

Compressed Gas Association (CGA): An association of firms producing and distributing compressed, liquefied, and cryogenic gases; also manufacturers of related equipment. CGA submits recommendations to appropriate government agencies to improve safety standards and methods of handling, transporting, and storing gases; acts as advisor to regulatory authorities and other agencies concerned with safe handling of compressed gases; collaborates with national organizations to develop specifications and standards of safety.

Computer Aided Management of Emergency Operations (CAMEO): A computer data base storage-retrieval system of pre-planning and emergency data for on-scene use at hazardous materials incidents.

Confinement: Procedures taken to keep a material in a defined or localized area.

Consignee: The addressee to whom the item is shipped.

Contact: Being exposed to an undesirable or unknown substance that may pose a threat to health and safety. (Sacramento Fire Department HMRT)

Container: Any device, in which a hazardous material is stored, transported, disposed of, or otherwise handled.

Container, Intermodal, ISO: An article of transport equipment that meets the standards of the International Organization for Standardization (ISO) designed to facilitate and optimize the carriage of goods by one or more modes of transportation without intermediate handling of the contents and equipped with features permitting ready handling and transfer from one mode to another. Containers may be fully enclosed with one or more doors, open top, tank, refrigerated, open rack, gondola, flatrack, and other designs. Included in this definition are modules or arrays that can be coupled to form an intrinsic unit regardless of intention to move single or in multiplex configurations.

Containment: All activities necessary to bring the incident to a point of stabilization and to establish a degree of safety for emergency personnel greater than existed upon arrival.

Contamination: An uncontained substance or process that poses a threat to life, health, or the environment. (NFPA 472, sections 1-3)

Contamination Control Line: The established line around the contamination reduction zone that separates it from the support zone.

Contamination Reduction Zone: Term used by the Coast Guard to identify the area of moderate hazard where threat of contamination spread to the immediate surrounding area is low. It is the area immediately outside of the inner hot zone. (See Warm Zone.)

Contingency Plan: A pre-planned document presenting an organized and coordinated plan of action to limit potential pollution in case of fire, explosion, or discharge of hazardous materials; defines specific responsibilities and tasks.

California Specialized Training Institute, 2009

Control: The procedures, techniques, and methods used in the mitigation of a hazardous materials incident, including containment, extinguishment, and confinement.

Control Zones: The designation of areas at a hazardous materials incident based upon safety and the degree of hazard. (NFPA 472, sections 1-3) (See Support Zone, Warm Zone, Hot Zone, and Decontamination Corridor.)

Coordination: To bring together, in a uniform and controlled manner, the functions of all agencies on scene. (Sacramento Fire Department HMRT)

Corrosive: The ability to cause destruction of living tissue or many solid materials surfaces by chemical action.

Cost Recovery: A procedure that allows for the agency having jurisdiction to pursue reimbursement for all costs associated with a hazardous materials incident. (Sacramento Fire Department HMRT)

Council on Environmental Alternatives (CEA): Encourages people to conserve, rather than consume, their environment. The Council concentrates on the area of energy, and provides specific recommendations that encourage individuals to recognize and assume responsibility for environmentally sound choices available to them.

Cryogenic: Gases, usually liquefied, that induce freezing temperatures of -150ºF and below (liquid oxygen, liquid helium, liquid natural gas, liquid hydrogen, etc.).

Damage Assessment: Gathering information on the type, extent, and costs of damage after an incident.

Damming: A procedure consisting of constructing a dike or embankment to totally immobilize a flowing waterway contaminated with a liquid or solid hazardous substance. (EPA, 600/2-77-277)

Dangerous When Wet: A label required for water reactive materials (solid) being shipped under U.S. DOT, ICAO, and IMO regulations. A labeled material that is in contact with water or moisture may produce flammable gases. In some cases, these gases are capable of spontaneous combustion. (49 CFR 171.8)

Declared Emergency: An action taken by a jurisdiction according to the California Emergency Services Act and local ordinances in response to the impact of a real or threatened hazard that exceeds local resources.

Decontamination (Decon): The physical and/or chemical process of reducing and preventing the spread of contamination from persons and equipment used at a hazardous materials incident. (Also referred to as "contamination reduction".) (NFPA 472, 1-3)

Decontamination Corridor: A distinct area within the warm zone that functions as a protective buffer and bridge between the hot zone and the cold zone, where decontamination stations and personnel are located to conduct decontamination procedures. (Sacramento Fire Department HMRT)

California Specialized Training Institute, 2009

Decontamination Officer: A position within the FIRESCOPE ICS HM-120 that has responsibility for identifying the decontamination corridor location & types of decontamination, assigning stations, and managing all decontamination procedures.

Decontamination Team: A group of personnel and resources operating within a decontamination corridor.

Degradation: The loss in physical properties of an item of protective clothing due to exposure to chemicals, use, or ambient conditions.

Delayed Toxic Exposure Effect: The condition in which symptoms of an exposure are not present immediately after the exposure, but are delayed for a relatively short period of time (such as pulmonary edema a few hours after an inhalation exposure).

Deleterious Substances: Substances not normally harmful to humans that may be harmful to the environment.

Department of Commerce (DOC): A Federal agency whose primary mission is to encourage, serve and promote economic development and technological advancement.

Department of Defense (DOD): The Federal entity that provides the military forces needed to deter war and protect the security of our country.

Department of Energy (DOE): The Federal agency which provides the framework for a comprehensive and balanced national energy plan through coordination and administration of the energy functions of the federal government; and to be responsible for long term, high risk research, development and demonstration of energy technology, the marketing of federal power, energy conservation, the nuclear weapons program, regulation of energy production and use, and a central energy data collection and analysis program.

Department of Justice (DOJ): The Federal department which serves as counsel for the citizens of the Nation; represents them in enforcing the law in the public interest; through its thousands of lawyers, investigators, and agents it plays a key role in protection against criminals and subversion, in insuring healthy competition of business in our free enterprise system, in safeguarding the consumer, and in enforcing drug, immigration, and naturalization laws; plays a significant role in protecting citizens through its efforts for effective law enforcement, crime prevention, crime detection, and prosecution and rehabilitation of offenders; conducts all suits in the Supreme Court in which the United States is concerned; and represents the Federal Government in legal matters.

Department of Labor (DOL): The purpose of the Department of Labor is to foster, promote, and develop the welfare of the wage earners of the United States, to improve their working conditions, and to advance their opportunities for profitable employment.

Department of State (DOS): This department advises the President in formulation and execution of foreign policy; promotes long-range security and well-being of the United States; determines and analyzes the facts relating to American overseas interest, makes recommendations on policy and future action, and takes the necessary steps to carry out established policy; engages in

California Specialized Training Institute, 2009

continuous consultation with the American public, the Congress, other U.S. departments and agencies, and foreign governments.

Department of Transportation (DOT): This agency assures the coordinated, effective administration of the transportation programs of the Federal government and develops national transportation policies and programs conducive to the provision of fast, safe, efficient and convenient transportation at the lowest possible cost.

Desiccant: A substance, such as silica gel, that removes moisture (water vapor) from the air to maintain a dry atmosphere in containers of food or chemical packaging.

Detectors:

- **Combustible Gas Indicator (CGI) detector:** Measures the presence of a combustible gas or vapor in air.
- **Corrosivity (pH) detector:** A meter or paper that indicates the relative acidity or alkalinity of a substance, generally using an international scale of 0 (acid) through 14 (alkali-caustic). (See pH.)
- **Flame Ionization detector (FID):** A device used to determine the presence of hydrocarbons in air.
- **Gas Chromatograph/ Mass Spectrometer detector (GC/MS):** An instrument used for identifying and analyzing organics.
- **Heat detector:** An instrument used to detect heat by sensing infrared waves.
- **Photoionization detector (PID):** A device used to determine the presence of gases/vapors in low concentrations in air.
- **Radiation Beta Survey detector:** An instrument used to detect beta radiation.
- **Radiation Dosimeter detector:** An instrument that measures the amount of radiation to which a person has been exposed.
- **Radiation Gamma Survey detector:** An instrument used for the detection of ionizing radiation, principally gamma radiation, by means of a gas-filled tube.
- **Temperature detector:** An instrument, either mechanical or electronic, used to determine the temperature of ambient air, liquids, or surfaces.

DHS: See California Department of Health Services.

Dike: An embankment or ridge, natural or man-made, used to control the movement of liquids, sludges, solids, or other materials.

Dike Overflow: A dike constructed in a manner that allows uncontaminated water to flow unobstructed over the dike while keeping the contaminant behind the dike.

Dike Underflow: A dike constructed in a manner that allows uncontaminated water to flow unobstructed under the dike while keeping the contaminant behind the dike.

Dispersion: To spread, scatter, or diffuse through air, soil, surface or ground water.

California Specialized Training Institute, 2009

Disposal Drum: A reference to a specially constructed drum used to overpack damaged or leaking containers of hazardous materials for shipment.

Diversion: The intentional, controlled movement of a hazardous material to relocate it into an area where it will pose less harm to the community and the environment. (Sacramento Fire Department HMRT)

Division: That organizational level within the ICS having responsibility for operations within a defined geographic area. The "Division" Officer directs approximately 5 Companies, and answers to the "Operations" Officer.

Dose: The amount of substance ingested, absorbed, and/or inhaled per exposure period.

Double gloving: A set of gloves worn over those already in place for enhanced protection.

Downwind: In the direction in which the wind blows.

Dust: Solid particles generated by handling, crushing, grinding, rapid impact, detonation, and decrepitation of organic or inorganic materials such as rock, ore, metal, coal, wood, and grain.

Ecology: A branch of science concerned with the interrelationship of organisms and their environments.

Economic Poison: As defined in the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), an economic poison is "any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any insects, rodents, nematodes, fungi, or weeds, or any other forms of life declared to be pests... any substance intended for use as a plant regulator, defoliant, or desiccant." As defined, economic poisons are generally known as pesticides.

Ecosystem: A habitat formed by the interaction of a community of organisms with their environment.

Edema: The swelling of body tissues resulting from fluid retention.

Emergency Medical Services (EMS): Functions as required to provide emergency medical care for ill or injured persons by trained providers.

Emergency Medical Services Agency: Plans and coordinates local public and private emergency medical services systems. Sets the local standards for medical care and transport of victims. California Health and Safety Code Section 1058 vests authority for patient care management in the most qualified medical care provider.

Emergency Medical Services Authority (EMSA): The State agency responsible for developing general guidelines for triage and handling of contaminated/exposed patients; develops and promotes hazardous materials training for emergency medical responders in the field and hospital emergency rooms; identifies and coordinates the procurement of medical assistance, supplies, and hospital beds when local and/or regional resources are depleted; and coordinates the evaluation of casualties to other areas of the State.

Emergency Operations Center (EOC): The secured site where government officials exercise centralized coordination in an emergency. The EOC serves as a resource center and coordina-

California Specialized Training Institute, 2009

tion point for additional field assistance. It also provides executive directives to and liaison for State and federal government representatives, and considers and mandates protective actions.

Emergency Operations Plan: A document that identifies the available personnel, equipment, facilities, supplies, and other resources in the jurisdiction, and states the method or scheme for coordinated actions to be taken by individuals and government services in the event of natural, man-made, and attack related disasters.

Emergency Reserve Account for Hazardous Material Incidents: A fund administered by the California Department of Toxic Substances Control to finance actions only for the purpose of remediation or prevention of threats of fire, explosion or human health hazards resulting from a release or potential release of a hazardous substance. (Health and Safety Code 25354)

Emergency Response: Response to any occurrence, which has or could result in a release of a hazardous substance. (8 CCR 5192), (19 CCR 2402)

Emergency Response Organization: An organization that utilizes personnel trained in emergency response. (19 CCR 2402)

Emergency Response Personnel: Personnel assigned to organizations that have the responsibility for responding to different types of emergency situations. (NFPA 1991, 1-3)

Empty Packaging: Any packaging having a capacity of 110 gallons or less that contains only the residue of a hazardous material in table 2 of 49 CFR 172.504.

Endothermic: A process or chemical reaction, which is accompanied by absorption of heat.

Engine (fire usage): Any emergency response vehicle providing specified levels of pumping, water, hose capacity, and personnel.

Entry Point: A specified and controlled location where access into the hot zone occurs at a hazardous materials incident.

Entry Team Leader: The entry leader is responsible for the overall entry operations of assigned personnel within the hot zone. (FIRESCOPE ICS-HM)

Environmental Protection Agency (EPA): The purpose of the Environmental Protection Agency (EPA) is to protect and enhance our environment today and for future generations to the fullest extent possible under the laws enacted by Congress. The Agency's mission is to control and abate pollution in the areas of water, air, solid waste, pesticides, noise, and radiation. EPA's mandate is to mount an integrated, coordinated attack on environmental pollution in cooperation with State and local governments.

EPA: See Environmental Protection Agency.

Etiological Agent: A viable microorganism or its toxin, which causes or may cause human disease.

Evacuation: The removal of potentially endangered, but not yet exposed, persons from an area threatened by a hazardous materials incident. (FIRESCOPE ICS-HM)

Explosive Ordnance Disposal (EOD): Military or civilian bomb squads.

California Specialized Training Institute, 2009

Extremely Hazardous Substances (EHS): Environmental Protection Agency (EPA) uses this term for chemicals that must be reported pursuant to SARA, Title III. The list of these substances and the threshold planning quantities are identified in 40 CFR 355. Releases of extremely hazardous substances as defined by EPA must be reported to the National Response Center. In California, the term Acutely Hazardous Material (AHM) is used. They are identical to the EHS in 40 CFR.

Extremely Hazardous Waste: Any hazardous waste or mixture of hazardous wastes which, if human exposure should occur, may likely result in death, disabling injury or serious illness caused by the hazardous waste or mixture of hazardous wastes because of its quantity, concentration or chemical characteristics.

Exclusion Zone: See Hot Zone.

Exothermic: A process or chemical reaction, which is accompanied by the evolution of heat.

Explosion-proof Equipment: Instruments whose enclosure is designed and constructed to prevent the ignition of an explosive atmosphere. Certification for explosion proof performance is subject to compliance with ASTM standards.

Explosive: Any chemical compound, mixture, or device, of which the primary or common purpose is to function by explosion, i.e., with substantial instantaneous release of gas and heat. (49 CFR 173.50)

Exposure: The subjection of a person to a toxic substance or harmful physical agent through any route of entry.

Facility: A. Any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, storage container, motor vehicle, rolling stock, or aircraft, or B. any site or area where a hazardous substance has been deposited, stored, disposed of, placed, or otherwise come to be located; but does not include any consumer product in consumer use or any water-borne vessel.

Fahrenheit: The scale of temperature in which 212°F is the boiling point of water at 760 mm Hg and 32°F is the freezing point.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA): An act that requires pesticides to be registered and labeled, makes it illegal to detach or destroy pesticide labels, and provides for pesticide inspections. An amendment to FIFRA now requires EPA to determine whether a pesticide "will perform its intended function without causing unreasonable adverse effects on the environment" or human health.

Federal Water Pollution Control Act (WPCA): See Clean Water Act.

Fibrosis: A condition marked by an increase of interstitial fibrous tissue.

Filter Canister: A container filled with sorbents and catalysts that removes gases and vapors from air drawn through the unit. The canister may also contain an aerosol (particulate) filter to remove solid or liquid particles. (Air purifying canister type breathing apparatus are not approved for use during emergencies by the fire service in California.)

California Specialized Training Institute, 2009

First Responder: The first trained person(s) to arrive at the scene of a hazardous materials incident. May be from the public or private sector of emergency services.

First Responder, Awareness Level: Individuals who are likely to witness or discover a hazardous substance release who have been trained to initiate an emergency response sequence by notifying the proper authorities of the release. They would take no further action beyond notifying the authorities of the release. (8 CCR 5192(q)(6))

First Responder, Operations Level: Individuals who respond to releases or potential releases of hazardous substances as part of the initial response to the site for the purpose of protecting nearby persons, property, or the environment from the effects of the release. They are trained to respond in a defensive fashion without actually trying to stop the release. Their function is to contain the release from a safe distance, keep it from spreading, and prevent exposures. (8 CCR 5192(q)(6))

Flammable Liquid: Any liquid having a flash point below 100ºF (37.8ºC). (49 CFR 173.115(a))

Flammable Range: A mixture of flammable gas, as mixed with air, expressed as a percent. Each gas has a range including a lower limit and upper limit and between these limits the mixture is flammable (explosive).

Flammable Solid: Any solid material, other than one classed as an explosive, which under conditions normally incident to transportation is liable to cause fires through friction, retains heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious transportation hazard. Included in this class are spontaneously combustible and water-reactive materials. (49 CFR 173.150)

Flashpoint: The minimum temperature of a liquid at which it gives off vapors sufficiently fast to form an ignitable mixture with air and will flash when subjected to an external ignition source, but will not continue to burn.

Food and Drug Administration (FDA): Performs, directs, and coordinates detection and control activities which protect consumers against adulterated, misbranded, or falsely advertised foods, drugs, medical devices, and hazardous products.

Full Protective Clothing: Protective clothing worn primarily by fire fighters which includes helmet, coat, pants, boots, gloves, and self-contained breathing apparatus designed for structural fire fighting. It does not provide specialized chemical protection.

Fully Encapsulating Suits: Chemical protective suits that are designed to offer full body protection, including Self Contained Breathing Apparatus (SCBA), are gas tight, and meet the design criteria as outlined in NFPA Standard 1991.

Fume: Airborne dispersion consisting of minute solid particles arising from the heating of a solid material such as lead, in distinction to a gas or vapor. This physical change is often accompanied by a chemical reaction, such as oxidation. Fumes flocculate and sometimes coalesce. Odorous gases and vapors should not be called fumes.

California Specialized Training Institute, 2009

Gas: A state of matter in which the material has very low density and viscosity; can expand and contract greatly in response to changes in temperature and pressure; easily diffuses into other gases; readily and uniformly distributes itself throughout any container. A gas can be changed to a liquid or solid state by the combined effect of increased pressure and/or decreased temperature.

Gelling: A process of adding a specific material that is designed to coagulate a liquid facilitating its isolation and removal.

Grounding: Method whereby activities that may generate static electricity will be prevented from discharging a spark and thereby not produce an ignition point.

Group: Groups are established to divide the incident into functional areas of operation.

Habitat: The native environment of an animal or plant; the natural place for life and growth of an animal or plant.

Halons: Fire suppressing gases that are composed of straight chain carbon atoms with a variety of halogen atoms attached.

Halogens: A chemical family that includes fluorine, chlorine, bromine, and iodine.

Hazard: Any situation that has the potential for causing damage to life, property, and/or the environment.

Hazard Class: The classification of hazardous materials as categorized and defined by the Department of Transportation in 49 CFR. The Hazardous Materials Table (49 CFR Part 172.101) designates specific materials as hazardous for the purpose of transportation. It also classifies each material and specifies requirements pertaining to its packaging, labeling, and transportation.

Class 1: Explosives

- Division 1.1 Explosives with a mass explosion hazard
- Division 1.2 Explosives with a projection hazard
- Division 1.3 Explosives with predominantly a fire hazard
- Division 1.4 Explosives with no significant blast hazard
- Division 1.5 Very insensitive explosives
- Division 1.6 Extremely insensitive explosive articles

Class 2: Gases

- Division 2.1 Flammable gases
- Division 2.2 Nonflammable gases
- Division 2.3 Poison gas
- Division 2.4 Corrosive gases

Class 3: Flammable liquids

- Division 3.1 Flashpoint below -18°C (0°F)

California Specialized Training Institute, 2009

- Division 3.2 Flashpoint—18°C and above, but less than 23°C (73°F)
- Division 3.3 Flashpoint 23°C and up to 61°C (141°F)

Class 4: Flammable solids; spontaneously combustible materials; & materials that are dangerous when wet

- Division 4.1 Flammable solids
- Division 4.2 Spontaneously combustible materials
- Division 4.3 Materials that are dangerous when wet

Class 5: Oxidizers and organic peroxides

- Division 5.1 Oxidizers
- Division 5.2 Organic peroxides

Class 6: Poisons and etiologic materials

- Division 6.1 Poisonous materials
- Division 6.2 Etiologic (infectious) materials

Class 7: Radioactive materials

- Any material, or combination of materials, that spontaneously gives off ionizing radiation. It has a specific activity greater than 0.002 microcuries per gram.

Class 8: Corrosives

- A material, liquid, or solid that causes visible destruction or irreversible alteration to human skin or a liquid that has a severe corrosion rate on steel or aluminum.

Class 9: Miscellaneous

- A material which presents a hazard during transport, but which is not included in any other hazard class (such as a hazardous substance or a hazardous waste).

ORM-D: Other regulated material

- A material, which, although otherwise subjected to regulations, presents a limited hazard during transportation due to its form, quantity and packaging.

Hazardous Air Pollutant: An airborne pollutant that may cause or contribute to an increase in mortality or serious illness.

Hazardous Chemical: A term used by the United States Occupational Safety and Health Administration (OSHA) to denote any chemical that would be a risk to employees if exposed in the workplace. The list of hazardous chemicals is found in 29 CFR.

Hazardous Material (Hazardous materials): A substance or combination of substances which, because of quantity, concentration, physical, chemical or infectious characteristics may cause, or significantly contribute to an increase in deaths or serious illness; and/or pose a substantial present or potential hazard to humans or the environment.

California Specialized Training Institute, 2009

Hazardous Material Categorization (HAZCAT): A field analysis process to determine basic hazardous materials hazard classification and some chemical and physical properties of unknowns.

Hazardous Material Incident Contingency Plan (HMICP): The State's hazardous materials emergency plan published by OES pursuant to Government Code §8574.17.

Hazardous Materials Emergency: The release or threatened release of a hazardous material that may impact the public health, safety and/or the environment.

Hazardous Materials Response Team (HMRT): An organized group of employees, designated by the employer, who are expected to perform work to handle and control actual or potential leaks or spills of hazardous substances requiring possible close approach to the substance. A Hazardous materials Team may be a separate component of a fire brigade or a fire department or other appropriately trained and equipped units from public or private agencies.

Hazardous Materials Response Team—Technician Level: Consists of an organized group of employees, designated by the employer in compliance with 8 CCR 5192(q)(6), trained to function at the hazardous materials incident at the Technician Level in accordance with NFPA 472, Chapter 3 (1990). Additionally, personnel on the team are capable of the following:

- The ability to carry out the duties of these positions as identified in FIRESCOPE ICS-HM-120:
  a. Group Supervisor
  b. Entry Leader
  c. Hazardous Material Safety Officer
  d. Site Access Control Officer
  e. Decontamination Leader
  f. Technical Specialist-Hazardous Material Reference

Note: Multiple positions can be handled by one person dependent upon the complexity and/or severity of the incident.

- Members are assigned positions in accordance with 8 CCR 5192 appropriately trained to include but not be limited to entry with splash protective clothing:
  a. Entry Team—2
  b. Backup Team—2

Hazardous Materials Response Team—Specialist Level: Consists of an organized group of employees, designated by the employer in compliance with 8 CCR 5192(q)(6), trained to function at the hazardous materials incident at the Specialist Level in accordance with NFPA Standard 472, Chapter 4 (1990). Additionally, personnel on the team are capable of the following:

- The ability to carry out the duties of these positions as identified in FIRESCOPE ICS-HM-120:
  a. Group Leader

California Specialized Training Institute, 2009

b. Entry Team Leader
c. Hazardous Material Safety Officer
d. Site Access Control Officer
e. Decontamination Leader
f. Technical Specialist-Hazardous Material Reference

Note: Multiple positions can be handled by one person dependent upon the complexity and/or severity of the incident.

- Members are assigned positions in accordance with 8 CCR 5192 appropriately trained for entry with vapor protective clothing:
  a. Entry Team—2
  b. Backup Team—2

Hazardous Materials Response Team—Specialty: Consists of an organized group of employees, designated by the employer in compliance with 8 CCR 5192(q)(6), who are trained in the hazards of specific hazardous substances, and/or specific techniques or support services, and/or the provision of specialized technical advice and assistance in compliance with 8 CCR 5192(q)(5). The Team is capable, either within their own team or in agreement with a Hazardous Materials Response Team on scene, of the following:

- The ability to carry out the duties of these positions as identified in FIRESCOPE ICS-HM-120:
  a. Group Supervisor
  b. Entry Team Leader
  c. Hazardous Material Safety Officer
  d. Site Access Control Officer
  e. Decontamination Leader
  f. Technical Specialist-Hazardous Material Reference

Note: Multiple positions can be handled by one person dependent upon the complexity and/or severity of the incident.

- Members are assigned positions in accordance with 8 CCR 5192 appropriately trained to include but not be limited to entry with splash protection:
  a. Entry team—2
  b. Backup team—2

Hazardous Substance: Hazardous Substance, as used by the California Department of Toxic Substances Control, encompasses every chemical regulated by both the Department of Transportation (hazardous materials) and the Environmental Protection Agency (hazardous waste), including emergency response (8 CCR 5192).

Hazardous substance removal work: Clean-up work at any of the following:

A. A site where removal or remedial action is taken pursuant to any of the following:

California Specialized Training Institute, 2009

1. Chapter 6.8 (commencing with Section 25300) of Division 20 of the Health and Safety Code, regardless of whether the site is listed pursuant to Section 25356 of the Health and Safety Code.
2. The federal Comprehensive Environmental Response, Compensation and Liability Act of 1980 (42 U.S.C. Sec. 9601 et seq.).
3. Any operations covered under subsections(a)(1)(A) through (a)(1)(C) of this section.

B. A site where corrective action is taken pursuant to Section 25187 or 25200.10 of the Health and Safety Code or the federal Resource Conservation and Recovery Act of 1976 (42 U.S.C. Sec. 6901 et seq.)

C. A site where clean-up of a discharge of a hazardous substance is required pursuant to Division 7 (commencing with Section 13000) of the Water Code.

D. A site where removal or remedial action is taken because a hazardous substance has been discharged or released in an amount that is reportable pursuant to Section 13271 of the Water Code or the federal Comprehensive Environmental Response, Compensation and Liability Act of 1980 (42 U.S.C. Sec. 6901 et seq.). Hazardous substance removal work does not include work related to a hazardous substance spill on a highway.

Hazardous Waste: 1) Waste materials or mixtures of waste which require special handling and disposal because of their potential to damage health and/or the environment; 2) The Environmental Protection Agency uses the term hazardous waste for chemicals that are regulated under the Resource Conservation and Recovery Act and are listed in 40 CFR 261.33 (d). Environmental Protection Agency or California Department of Toxic Substances Control regulated hazardous waste, when in transport, must also meet 49 CFR parts 170 through 179. California's definition of hazardous waste is more inclusive than EPA's, and is found in 22 CCR, Section 66261.2.

Hazardous Waste Facility: Any location used for the treatment, transfer, disposal or storage of hazardous waste as permitted and regulated by the California Department of Toxic Substances Control.

Hazardous Waste Generation: The act or process of producing hazardous waste.

Hazardous Waste Landfill: An excavated or engineered area on which hazardous waste is deposited and covered. Proper protection of the environment from the materials to be deposited in such a landfill requires careful site selection, good design, proper operation, leachate collection & treatment, and thorough final closure.

Hazardous Waste Leachate: Any liquid that has percolated through or drained from hazardous waste placed in or on the ground.

Hazardous Waste Management: Systematic control of the collection, source separation, storage, transportation, processing, treatment, recovery, and disposal of hazardous wastes.

California Specialized Training Institute, 2009

Hazardous Waste Manifest, Uniform: The shipping document, originated and signed by the waste generator or an authorized representative, that contains the information required by law and must accompany shipments of hazardous waste. (40 CFR 262, Subpart B)

Hazardous Waste Site: A location where hazardous wastes are located, and there is either a threat of a release or an actual release of these wastes which may have an adverse effect on public health or the environment.

Health Hazard, Chemical: Any chemical or chemical mixture, whose physical or chemical properties may cause acute or chronic health effects [8 CCR 5192 (a)(3)].

Heavy Metal: A high-density metallic element that may demonstrate health hazards as a result of exposure and may contribute to contamination of the environment. This includes chromium (Cr), beryllium (Be), lead (Pb), mercury (Hg), zinc (Zn), copper (Cu), cadmium (Cd) and others.

Hepatotoxic: A substance that negatively affects the liver.

Herbicide: An agricultural chemical intended for killing plants or interrupting their normal growth. (See Pesticides.)

High Performance Liquid Chromatography (HPLC): A procedure used in organics analysis to separate chemical mixtures based on differential ionic absorption to various substrates.

Hot Tapping: A sophisticated method of welding on and the cutting of holes through liquid, compressed gas vessels, and piping for the purpose of relieving pressure and/or removing product.

Hot Zone: An area immediately surrounding a hazardous materials incident, which extends far enough to prevent adverse effects from hazardous materials releases to personnel outside the zone. This zone is also referred to as the "exclusion zone", the "red zone", and the "restricted zone" in other documents. (NFPA 472, 1-3)

Hazardous Materials Transportation Act (HMTA): The Hazardous Materials Transportation Act of 1975 (HMTA), is the major transportation-related statute affecting transportation of hazardous cargoes Regulations apply to ". . . any person who transports, or causes to be transported or shipped, a hazardous material; or who manufactures, fabricates, marks, maintains, reconditions, repairs, or tests a package or container which is represented, marked, certified, or sold by such person for use in the transportation in commerce of certain hazardous materials."

Hygroscopic: A substance that has the property of absorbing moisture from the air, such as silica gel.

Hypergolic: Two chemical substances that spontaneously ignite upon mixing.

Ignitable Material: Any material having, as a liquid, a flash point less than 140o F or, if not a liquid, is capable of causing fire through friction, absorption of moisture or spontaneous chemical changes.

Ignition Temperature: The minimum temperature at which a material will initiate or maintain combustion.

California Specialized Training Institute, 2009

Immediately Dangerous to Life or Health (IDLH): An atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere. (8 CCR 5192(a)3)

Information Officer (IO): The individual assigned to act as the liaison between the Incident Commander and the news media, as well as other groups.

Incident: An event involving a hazardous material or a release or potential release of a hazardous material.

Incident Action Plan (IAP): A plan developed at the field response level that contains objectives reflecting the overall incident strategy and specific tactical actions and supporting information for the next operational period. The plan may be oral or written.

Incident Command: A disciplined method of management established for the specific purpose of control and direction of resources and personnel.

Incident Commander (IC): The individual responsible for overall management of the incident at the field level.

Incident Command Post: See Command Post.

Incident Command System (ICS): The combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure, with responsibility for the management of resources to effectively accomplish stated objectives pertinent to an incident.

Incompatible Waste: Waste unsuitable for commingling with another waste or material.

Industrial Wastes: Unwanted materials produced in or eliminated from an industrial operation.

Infectious Waste: Waste containing pathogens; may consist of tissues, organs, body parts, blood, and body fluids.

Ingestion: The process of taking substances such as food, drink, and medicine into the body through the mouth.

Inhibitor: A chemical added to another substance to prevent or slow down an unwanted or sudden occurrence of chemical change.

Inorganic Compounds: Chemical compounds that do not contain the element carbon with the exception of carbon oxides and carbon sulfides.

Insecticide: A chemical product used to kill and control insects. (See Pesticides.)

International Air Transport Association (IATA): An association of air carriers that develop guidelines for transportation of cargo.

International Civil Aviation Organization (ICAO): An organization that develops the principles and techniques of international air navigation and fosters the planning and development of international air transport so as to insure safe and orderly growth.

California Specialized Training Institute, 2009

Investigate: To systematically search or inquire into the particulars of an incident, and collect the necessary evidence to seek criminal and/or civil prosecution.

Irritant: A material that has an anesthetic, irritating, noxious, toxic, or other similar property that can cause extreme annoyance or discomfort. (49 CFR)

Isolating the Scene: Preventing persons and equipment from becoming exposed to a release or threatened release of a hazardous material by the establishment of site control zones.

Jurisdiction Specific Plan: A plan that details emergency activities, capabilities, responsibilities and resources within an area, agency, facility or political subdivision.

Labpack: Putting multiple small containers of chemicals with compatible chemical characteristics in a disposal drum with absorbent material.

Lacrimation: Tearing produced by eye irritation.

LC50 (lethal concentration, 50%): The amount of a toxicant in air that is deadly to 50% of the exposed lab animal population within a specified time.

LD50 (lethal dose, 50%): The amount of a toxicant administered by other than inhalation which is deadly to 50% of the exposed lab animal population within a specified time.

Leak: The uncontrolled release of a hazardous material that could pose a threat to health, safety, and/or the environment.

Leak Control Compounds: Substances used for the plugging and patching of leaks in non-pressure containers.

Leak Control Devices: Tools and equipment used for the plugging and patching of leaks in non-pressure and some low-pressure containers, pipes, and tanks.

Level of Protection: In addition to appropriate respiratory protection, designations of types of personal protective equipment to be worn based on NFPA standards.

- Level A—Vapor protective suit for hazardous chemical emergencies.
- Level B—Liquid splash protective suit for hazardous chemical emergencies.
- Level C—Limited use protective suit for hazardous chemical emergencies.

Level One Incident: Hazardous materials incidents which can be correctly contained, extinguished, and/or abated utilizing equipment, supplies, and resources immediately available to first responders having jurisdiction, and whose qualifications are limited to and do not exceed the scope of training as explained in 8 CCR 5192, or California Government Code (CGC), Chapter 1503, with reference to "First Responder, Operational Level".

Level Two Incident: Hazardous materials incidents which can only be identified, tested, sampled, contained, extinguished, and/or abated utilizing the resources of a Hazardous Materials Response Team, which requires the use of specialized chemical protective clothing, and whose qualifications are explained in 8 CCR 5192, or California Government Code (CGC), Chapter 1503, with reference to "Hazardous Materials Technician Level".

California Specialized Training Institute, 2009

Level Three Incident: A hazardous materials incident which is beyond the controlling capabilities of a Hazardous Materials Response Team (Technician or Specialist Level) whose qualifications are explained in 8 CCR 5192, or California Government Code, Chapter 1503; and/or requires the use of two or more Hazardous Materials Response Teams; and/or must be additionally assisted by qualified specialty teams or individuals.

Local Disaster Plan: A plan developed and used by local government for extraordinary events.

Local Emergency Planning Committee (LEPC): A committee appointed by a State emergency response commission, as required by SARA Title III, to formulate a comprehensive emergency plan for its corresponding Office of Emergency Services mutual aid region.

Local Government: Local agencies as defined in Government Code § 8680.2 and special districts as defined in California Code of Regulations, Title 19 Division 2, Chapter 5, NDAA, § 2900 (y).

Localized Exposure: Contact with a limited area, usually an external body surface.

Logistics Chief: That organizational position within the ICS having responsibility for summoning and managing support, apparatus, equipment and personnel.

Lower Explosive Limit (LEL): The lowest concentration of the material in air that can be detonated by spark, shock, or fire, etc.

Macroencapsulation: The isolation of a waste by embedding it in, or surrounding it with, a material that acts as a barrier to water or air (e.g., clay and plastic liners).

Manifest, Uniform Hazardous Waste: A document required by 40 CFR 262 to accompany any shipment of hazardous waste from the point of generation to the point of final disposal/destruction. (See Shipping Papers and Hazardous Waste Manifest, Uniform)

Marking: The required descriptive name, instructions, cautions, weight, or specifications or combination thereof on containers of hazardous materials/hazardous waste.

Material Safety Data Sheet (MSDS): A document which contains information regarding the specific identity of hazardous chemicals, including information on health effects, first aid, chemical and physical properties, and emergency phone numbers.

Melting Point The temperature at which a material changes from a solid to a liquid.

Microorganism: A living organism not discretely visible to the unaided eye.

Midnight Dumping: Illegal disposal of hazardous materials.

Mist: Suspended liquid droplets generated by condensation from the gaseous to the liquid state or by breaking up a liquid into a dispersed state, such as by splashing, foaming, or atomizing. A mist is formed when a finely divided liquid is suspended in air.

Mitigation: Any action employed to contain, reduce, or eliminate the harmful effects of a spill or release of a hazardous material.

Monitoring: The act of systematically checking to determine contaminant levels and atmospheric conditions.

California Specialized Training Institute, 2009

Monitoring Environmental Contamination: Use of instruments and other techniques to determine the presence or levels of hazardous materials.

Monitoring Equipment: Instruments and devices used to identify, qualify, and/or quantify contaminants.

Mutagen: A substance capable of causing genetic damage.

Mutual Aid: An agreement to supply, if available, specifically agreed upon aid or support in an emergency situation between two or more agencies, jurisdictions, or political sub-divisions without the expectation of reimbursement.

Narcosis: Stupor or unconsciousness produced by chemical substances.

National Contingency Plan (NCP): Created by CERCLA to define the federal response authority and responsibility for oil and hazardous material spills.

National Fire Protection Association (NFPA): An international voluntary membership organization to promote improved fire protection and prevention, establish safeguards against loss of life and property by fire, and writes and publishes the American National Standards.

National Interagency Incident Management System (NIIMS): A standardized systems approach to incident management that consists of five major sub-divisions collectively providing a total systems approach to all-risk incident management.

National Institute for Occupational Safety and Health (NIOSH): A Federal agency, which, among other activities, tests and certifies respiratory protective devices, air-sampling detector tubes, and recommends occupational exposure limits for various substances.

National Oceanic and Atmospheric Administration (NOAA): The agency responsible to serve as scientific support coordinator for a federal on scene coordinator. Assists in oil spill and air toxics modeling and meteorological monitoring and oceanic research.

National Pesticide Telecommunications Network (NPTN): The 24-hour national hotline (800) 858-PEST operated by the Texas Tech University School of Medicine providing toll-free information about pesticide safety, application, chemistry and toxicology to callers in the U.S., Puerto Rico, and the Virgin Islands. Questions are answered directly or via next day mail.

National Response Center (NRC): A communications center operated by the United States Coast Guard headquarters located in Washington, DC. They provide information on suggested technical emergency actions, and must be notified by the spiller within 24 hours of any spill of a reportable quantity of a hazardous substance.

Necrosis: Death in a particular part of a living tissue.

Nephrotoxic: A substance that negatively affects the kidneys.

Neurotoxic: A substance that negatively affects the nervous system.

Neutralization: The process by which acid or alkaline properties of a solution are altered by addition of certain reagents to bring the hydrogen and hydroxide concentrations to equal value (pH 7 is neutral).

California Specialized Training Institute, 2009

Non-flammable Gas: Any material or mixture, in a cylinder or tank, other than poison or flammable gas, having an absolute pressure in the container exceeding 40 p.s.i at 70°F, or having an absolute pressure exceeding 104 p.s.i at 130°F. (49 CFR)

North American (NA) Identification Number: A four-digit number, preceded by "NA", used in the United States and Canada to identify a hazardous material or group of hazardous materials in transportation.

Not Otherwise Specified (NOS or n.o.s.): In shipping regulations, the term is used for classes of substances to which restrictions apply, but for which the individual members of the class are not listed in the regulations.

Occupational Safety and Health Administration (OSHA): Component of the United States Department of Labor; an agency with safety and health regulatory and enforcement authorities for most United States industries, businesses and States.

Odor Threshold: The lowest concentration in the atmosphere that can be detected by the human sense of smell. Often a poor indicator of toxicity risk.

Office of Hazardous Materials Safety (OHMS): A Federal agency tasked with the research and recommended revisions to 49 CFR.

Oil: Any of numerous mineral, vegetable, and synthetic substances and vegetable and animal fats those are generally slippery, combustible, viscous, liquid or liquefiable at room temperature.

Oil Spill Cleanup Agent: Any material used in removing oil from the environment, including inert sorbent materials, approved chemical dispersants, surface collecting agents, sinking agents, and biological additives.

Olfactory: Pertaining to the sense of smell.

On-Scene Coordinator (OSC): As explained in the National Contingency Plan, it is the predesignated Federal official who coordinates Federal activities at a hazardous material incident, and monitors the incident for compliance with Federal pollution laws.

Operations: The coordinated tactical response of all field operations in accordance with the Incident Action Plan.

Oral Toxicity: Adverse effects resulting from taking a substance into the body through the mouth.

Organic Peroxide: Strong oxidizers, often chemically unstable, containing the -o-o- structure. They react readily with solvents or fuels resulting in an explosion or fire.

Overpack: An enclosure used to consolidate two or more packages of hazardous material. "Overpack" does not include a freight container.

Oxidizer: A chemical, other than a blasting agent or explosive, that initiates or promotes combustion in other materials thereby causing fire either of itself or through the release of oxygen or other gases. (49 CFR 173.151)

Oxygen Deficiency: A concentration of oxygen insufficient to support life.

California Specialized Training Institute, 2009

Oxygen Deficient Atmosphere: An atmosphere that contains an oxygen content less than 19.5 % by volume at sea level.

Pacific Strike Team: The National Strike Force pollution control team equipped and trained to assist in responses to oil or chemical incidents occurring in the western United States and administered by the United States Coast Guard.

Pallets: Low portable platform constructed of wood, metal, plastic, or fiberboard, built to specified dimensions, on which supplies are loaded, transported, or stored in units.

Parts Per Billion (ppb): A unit for measuring the concentration of a particular substance equal to one (1) unit combined with 999,999,999 other units.

Parts Per Million (ppm): A unit for measuring the concentration of a particular substance equal to one (1) unit combined with 999,999 other units.

Pathogen: Any disease producing organism, including viruses.

PCB Contaminated Electrical Equipment: Any electrical equipment, including transformers, that contains at least 50 ppm but less than 500 ppm of PCBs. (40 CFR 761.3)

PCB Item: An item containing PCBs at a concentration of 5 ppm or greater.

(40 CFR 761.3)

PCB Transformer: Any transformer that contains 500 ppm of PCBs or greater. (40 CFR 761.3)

Penetration: The movement of liquid molecules through a chemical protective clothing, suit, garment or material.

Permeation: The movement of vapor or gas molecules through a chemical protective garment material.

Permeation Kits: Kits assembled for the purpose of testing on-site an unknown liquid substance for permeability of chemical protective clothing.

Permissible Exposure Limit (PEL): The employees' permitted exposure limit to any material listed in Table Z-1, Z-2, or Z-3 of OSHA regulations, section 1910.1000, Air Contaminants.

Persistent Toxic Substance: A material or waste that resists natural degradation or detoxification and may present long term health and environmental hazards.

Personal Protective Equipment (PPE): Equipment provided to shield or isolate a person from the chemical, physical, and thermal hazards that may be encountered at a hazardous materials incident. Adequate personal protective equipment should protect the respiratory system, skin, eyes, face, hands, feet, head, body, and hearing. Personal protective equipment includes- personal protective clothing, self-contained positive pressure breathing apparatus, and air purifying respirators. (NFPA 472, 1-3)

Pesticides: A chemical or mixture of chemicals used to destroy, prevent, or control any living organism considered to be a pest.

California Specialized Training Institute, 2009

pH: A numerical designation of the negative logarithm of hydrogen ion concentration. A pH of 7.0 is neutrality; higher values indicate alkalinity and lower values indicate acidity.

Plugging and Patching Kits: Kits commercially available or privately assembled for the purpose of providing capabilities for emergency plugging and patching of leaking containers, pipes, and tanks.

Plume: A vapor, liquid, dust, or gaseous cloud formation that has shape and buoyancy.

Pneumonitis: Inflammation of the lungs characterized by an outpouring of fluid in the lungs.

Poison Control Centers: California is served by four certified and designated regional poison control centers. Each PCC is available 24 hours a day and can provide immediate health effects, scene management, victim decontamination, and other emergency medical treatment advice for hazardous materials emergencies. A physician specializing in medical toxicology is available for back-up consultation.

Pollution: Contamination of air, water, land, or other natural resources that will or is likely to create a public nuisance and cause health and environmental harm.

Polychlorinated Biphenyl (PCB): One of several aromatic compounds containing two benzene nuclei with two or more chlorine atoms.

Polymerization: A chemical reaction, usually carried out with a catalyst, heat, or light, and often under high pressure, which generates high temperature and when uncontrolled may be violent.

Post Emergency Response: That portion of an emergency response performed after the immediate threat of a release has been stabilized or eliminated and cleanup of the site has begun.

Post-Incident Analysis: The termination phase of an incident that includes completion of the required forms and documentation for conducting a critique.

Pre-incident Planning: The process associated with preparing for the response to a hazard by developing plans, identifying resources, conducting exercises, and other techniques to improve an agency's or organization's response capabilities.

Prevention Plan: See California Accidental Release Prevention Program (CalARP).

Product Substitution: Replacing a hazardous substance in a process with a less hazardous substance.

Proper Shipping Name: The DOT designated name for a commodity or material. (49 CFR 172.101)

Proposition 65: California Safe Drinking Water Act of 1986.

Protective Clothing: See Personal Protective Equipment (PPE).

Pulmonary: Pertaining to the lungs.

Pyrophoric: A substance that ignites spontaneously in dry or moist air at or below 130o F. (49 CFR 173.115(c))

California Specialized Training Institute, 2009

Qualitative Fit Test: A physical testing of a breathing apparatus face piece to the wearer, performed in an atmosphere of amyl acetate or irritant smoke to evaluate whether the wearer can detect the contaminant, indicating mask leakage and improper fit.

Radiation Absorbed Dose (RAD): A basic unit of absorbed dose of ionizing radiation.

Radioactive The spontaneous disintegration of unstable nuclei accompanied by emission of nuclear radiation.

Radioactive Material (RAM): Any material, or combination of materials, that spontaneously emits ionizing radiation and has a specific activity greater than 0.002 microcuries per gram. (49 CFR 173.389)

Recorder: See Technical Specialist—Hazardous Materials Reference.

Recovery Drum: See Disposal Drum.

Reference Library: A selection of chemical textbooks, reference books, microfiche, and computer data programs typically carried by a hazardous materials response team.

Regional Plan: A hazardous material plan developed pursuant to SARA Title III.

Regional Response Team: Composed of representatives of the Federal agencies and a representative from each State in the ten Federal EPA regions as specified in the NCP.

Regional Water Quality Control Board (RWQCB): This agency in conjunction with the State Water Resources Control Board (SWRCB) is charged with managing statewide water quality.

Release, Threatened Release: The actual or potential spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment, including the abandonment or discarding of barrels, containers, and other closed receptacles of any hazardous material.

Remedial Action: Actions taken to mitigate the effects of a release or threatened release of a hazardous material to protect health or the environment.

Removal Action: See Mitigation.

Reportable Incident: Any incident that has or may impact the public health, safety or the environment, or is otherwise required by law to be reported.

Reportable Quantity (RQ): The designated amount of a specific material that if spilled or released requires immediate notification to the National Response Center (NRC).

(49 CFR 172.101, 40 CFR 117.3, 173. and 302.6)

Rescue: The removal of victims from an area determined to be contaminated or otherwise hazardous by appropriately trained and equipped personnel.

Residue: A material remaining in a package after its contents have been emptied and before the packaging is refilled, or cleaned and purged of vapor to remove any potential hazard.

California Specialized Training Institute, 2009

Resource Conservation and Recovery Act (RCRA): The Federal framework for the proper management and disposal of hazardous wastes. This program is administered by EPA and may be delegated to the States.

Respiratory Protective Equipment: See SCBA and Air Purifying Respirators.

Response: That portion of incident management where personnel are involved in controlling a hazardous material incident. (NFPA 472, 1-3)

Responsible Party (RP): A legally recognized entity (person, corporation, business, or partnership, etc.) that has a legally recognized status of financial accountability and liability for action necessary to abate and mitigate adverse environmental and human health and safety impacts resulting from a non-permitted release or discharge of hazardous material; the person or agency found legally accountable for the cleanup of the incident.

Risk Analysis: A process to analyze the probability that harm may occur to life, property, and the environment and to note the risks to be taken to identify the incident objectives.

Risk Management: Decision-making process which involves such considerations as risk assessment, technological feasibility, economic information about costs and benefits, statutory requirements, public concerns, and other factors.

Risk Management Prevention Plan (RMPP): This program has been replaced by the California Accidental Release Prevention Program (CalARP).

Roentgen: A measure of the charge produced in air created by ionizing radiation, usually in reference to gamma radiation.

Roentgen Equivalent Man (REM): The unit of dose equivalent; takes into account the effectiveness of different types of radiation.

Rupture: The physical failure of a container or mechanical device, releasing or threatening to release a hazardous material. (Sacramento Fire Department HMRT)

Safety Officer: Selected by the Incident Commander, a person at an emergency incident responsible for assuring that all overall operations performed at the incident by all agencies present are done so with respect to the highest levels of safety and health. The Safety Officer shall report directly to the Incident Commander.

Salvage Drum: See Recovery Drum.

Sample: To take a representative portion of the material for evidence or analytical purposes.

SARA Title III Regional Plan: See Regional and Local Plan.

SCBA: See "Self Contained Breathing Apparatus".

Scenario: An outline of a natural or expected course of events.

Scene: The location impacted or potentially impacted by a hazard.

Secondary Materials: Spent materials, sludges, by-products, scrap metal and commercial chemical products recycled in ways that differ from their normal use.

California Specialized Training Institute, 2009

Selective Toxicity: The capacity of a chemical to injure one kind of living matter without harming another, even though the two may be in intimate contact.

Self Contained Breathing Apparatus (SCBA): A positive pressure, self-contained breathing apparatus (SCBA) or combination SCBA/supplied air breathing apparatus certified by the National Institute for Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA), or the appropriate approval agency for use in atmospheres that are immediately dangerous to life or health (IDLH). (NFPA 1991, 1-3)

Sensitizer: A substance which on first exposure causes little or no reaction in humans or test animals, but which on repeated exposure may cause a marked response not necessarily limited to the contact site.

Sheltering In Place/In Place Protection: To direct people to quickly go inside a building and remain inside until the danger passes.

Shipping Papers: Generic term used to refer to documents that must accompany all shipments of goods for transportation. These include Uniform Hazardous Waste Manifests, Bills of Lading, Consists, etc. Shipping papers are intended to describe what hazardous materials are contained within the shipment, if any.

Short Term Exposure Limit (STEL): See Threshold Limit Value—Short Term Exposure Limit (TLV-STEL).

Site: Any facility or location within the scope of 8 CCR 5192(a)(3).

Skimmer: Physical systems whereby a liquid phase is recovered from another liquid phase due to polarity differences and stored or transferred for further processing. Typical use is to remove petroleum products floating on a water body.

Sludge: Accumulated solids, semisolids, or liquid waste generated from wastewaters, drilling operations, or other fluids.

Smoke: An air suspension (aerosol) of particles, often originating from combustion or sublimation.

Solidification: Process whereby a contaminant is permanently immobilized in a substrate to prevent future migration away from the container.

Solubility: The ability or tendency of one substance to blend uniformly with another.

Solvents: A liquid substance capable of dissolving or dispersing one or more other substances to form a uniformly dispersed mixture.

Spill: The release of a liquid, powder, or solid hazardous materials in a manner that poses a threat to air, water, ground, and to the environment. (See Incident)

Spiller: See Responsible Party.

Spontaneously Combustible: See Pyrophoric.

Stabilization: The period of an incident where the adverse behavior of the hazardous material is controlled. (NFPA 472, 1-3)

California Specialized Training Institute, 2009

Staging Area: The area established for temporary location of available resources closer to the incident site to reduce response time.

State Warning Center (OES Warning Center): The Governor's Office of Emergency Services Warning Center facilitates emergency communications with government agencies at all levels. The Warning Center monitors seismic activity, weather and other conditions that could cause a disaster and is the central reporting office for any release or threatened release of a hazardous material. The Warning Center is the initial contact point in the state to initiate coordination and begin to mobilize federal, state and local agencies during a disaster.

Storage: Containment of hazardous materials on a temporary basis in such a manner as to not constitute disposal of such materials.

Strict Liability: The responsible party is liable even though they have exercised reasonable care.

Superfund Amendments & Reauthorization Act (SARA): Created for the purpose of establishing Federal statutes for right-to-know standards, emergency response to hazardous materials incidents, re-authorized the Federal superfund, and mandated States to implement equivalent regulations/requirements.

Support Zone: See Cold Zone.

Surface Impoundment: A natural depression, human made excavation or diked area designed to hold an accumulation of liquid wastes or waste containing free liquids.

Synergistic Effect: The combined effect of two chemicals that is greater than the sum of the effect of each agent alone.

Systemic: Pertaining to the internal organs and structures of the body.

Systemic Toxic Exposure: Toxic effects to the body as a whole spreading via the bloodstream and often displaying delayed symptoms.

Team Leader: See Entry Team Leader.

Technical Specialist—Hazardous Materials Reference: Person assigned to document activities of the Hazardous Material Team and gather information relevant to the chemicals involved and their hazards.

Teratogen: A substance or agent that can result in malformations of a fetus.

Teratogenicity: Ability to produce birth defects.

Termination: That portion of incident management where personnel are involved in documenting safety procedures, site operations, hazards faced, and lessons learned from the incident. Termination is divided into three phases- Debriefing, Post-Incident analysis, and Critique. (NFPA 472, 1-3) (See Post-Incident Analysis.)

Thieving Rod: A glass rod used like a COLIWASSA, except the liquid is contained in the tube by a vacuum pressure.

Threshold: The point where a physiological or toxicological effect begins to be produced by the smallest degree of stimulation.

California Specialized Training Institute, 2009

Threshold Limit Value (TLV): The value for an airborne toxic material that is to be used as a guide in the control of health hazards and represents the concentration to which nearly all workers may be exposed 8 hours per day over extended periods of time without adverse effects.

Threshold Limit Value—Ceiling (TLV-C): The concentration that should not be exceeded during any part of the working exposure.

Threshold Limit Value—Time Weighted Average (TLV-TWA): An exposure level under which most people can work consistently for 8 hours a day, day after day, with no harmful effects.

Threshold Limit Value Short Term Exposure Limit (TLV-STEL): A 15-minute time-weighted coverage exposure which should not be exceeded at any time during a work day, nor repeated more than 4 times per day, even if the 8-hour time-weighted average is within the Threshold Limit Value (TLV).

Threshold Planning Quantity (TPQ): The quantity designated for each extremely hazardous substance that triggers a required notification by facilities to the State emergency response commission that such facilities are subject to reporting under SARA Title III.

Totally Encapsulated Suits: Special protective suits made of materials that prevent toxic or corrosive substances or vapors from coming in contact with the body. (See Fully Encapsulated Suit.)

Toxic: Poisonous; relating to or caused by a toxin; able to cause injury by contact or systemic action to plants, animals or people.

Toxic Chemicals: EPA uses this term for chemicals whose total emissions and releases must be reported annually by owners and operators of certain facilities that manufacture, process or otherwise use a listed toxic chemical as identified in SARA Title III.

Toxicity: A relative property of a chemical agent that refers to its harmful effect on some biological mechanism and the conditions under which this effect occurs.

Traffic Control/Crowd Control: Action(s) by law enforcement to secure and/or minimize exposure of the public to unsafe conditions resulting from emergency incidents, impediments and congestion.

Treatment: Any method, technique, or process which changes the physical, chemical, or biological character or composition of any hazardous waste, or removes or reduces its harmful properties or characteristics for any purpose.

United Nations (UN) Identification Number: When UN precedes a four-digit number, it indicates that this identification number is used internationally to identify a hazardous material.

Upper Explosive Limit (UEL): The highest concentration of the material in air that can be detonated.

Upwind: In or toward the direction from which the wind blows.

Vapor: An air dispersion of molecules of a substance that is normally a liquid or solid at standard temperature and pressure.

California Specialized Training Institute, 2009

Vapor Dispersion: The movement of vapor clouds in air due to turbulence, gravity, spreading, and mixing.

Vapor Protective Suit: See Levels of Protection.

Vulnerability: The susceptibility of life, the environment, and/or property, to damage by a hazard.

Warm Zone: The area where personnel and equipment decontamination and hot zone support takes place. It includes control points for the access corridor and thus assists in reducing the spread of contamination. This is also referred to as the "decontamination", "contamination reduction", "yellow zone", or "limited access zone" in other documents. (NFPA 472, 1-3)

Water Reactive: Having properties of, when contacted by water, reacting violently, generating extreme heat, burning, exploding, or rapidly reacting to produce an ignitable, toxic, or corrosive mist, vapor, or gas.

California Specialized Training Institute, 2009