24- Hour
Industrial Emergency Response
-Operations Level
Instructor Manual
March 2015

Acknowledgments

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See www.eh.uc.edu/mwc/ for a listing of contacts at each member institution and additional information. We encourage you to comment on these materials. Please give your suggestions to those teaching the program in which you are now enrolled, or forward them to the Midwest Consortium for Hazardous Waste Worker Training, University of Cincinnati, P.O. Box 670056, Cincinnati, Ohio 45267-0056 or click on 'contact us' at www.eh.uc.edu/mwc/.

Warning

Disclaimer

This training is intended to meet the requirements of the OSHA Hazardous Waste Operations and Emergency Response Final Rule (1910.120 effective March 6, 1990) for first-responder personnel who will perform at the operations level at industrial hazardous material incidents. The training program covers basic hazard recognition; use of provided protective equipment; basic control, containment, confinement, and decontamination procedures; other relevant standard operating procedures; and incident termination. It does **not** provide the necessary skills to equip trainees to perform more advanced activities. Additional training is necessary to perform the activities of hazardous materials technicians or specialists. These activities include implementing the emergency response plan, identifying materials using monitoring instruments, selecting protective equipment, and performing advanced control, containment, or confinement.
For further information about this matter, consult the training instructor and/or your company's safety/emergency response plan, your union health and safety specialist, or the Local Emergency Planning Committee for your city or county.

Contents

Course Overview – Instructor Guide

Participants are here because they are members of an emergency response team which may have to respond to an incident involving hazardous materials at an industrial facility.

This course is designed to satisfy the requirements for personnel whose duties and functions are consistent with the description for Operations-Level First Responder as described in 29 CFR 1910.120, (q) (6) (ii):

> "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 confine the release from a ***safe*** distance, keep it from spreading, and prevent exposures." (emphasis added)

The length of the course is 24 contact hours, as required by OSHA:

- The Final Rule requires that the content include topics described under (q) (6) (ii) [operations] and (q) (6) (i) [awareness]. A minimum of 24 hours is required to adequately cover the required topics. A description of these requirements is listed on the next page.
- To be eligible for the next level of training, Hazardous Materials Technician, 24-hours of previous training at the Operations-level is required.

Requirements for Emergency Responders Awareness Level:

- Understand hazardous materials and associated risks
- Understand potential outcomes of emergencies
- Have the ability to recognize hazardous materials
- Identify hazardous materials if possible, using resources such as the Emergency Response Guidebook
- Understand the role of emergency responder
- Have the ability to contact appropriate personnel

Requirements for Emergency Responders Operations Level:

- Fulfill requirements of Awareness Level
- Basic hazard and risk assessment techniques
- Select and use proper personal protective equipment that is
- provided
- Basic hazardous materials terms
- Basic control, and/or confinement operations
- Basic decontamination
- Understanding of relevant standard operating procedures
- Termination procedures

Instructor Preparation

The course is designed for use with both open enrollment and contract audiences. Pre-planning with company personnel for delivery of the program is an important part of preparation for contract programs. Employer documents such as the facility Emergency Response Plan and relevant SOPs may be included in the training program. It is important that these documents be reviewed before using them to assure that minimum OSHA requirements are satisfied.

In the event that the documents are inadequate, the areas of concern should be addressed with facility management. During the delivery of training, instructors must cover basic OSHA requirements, even if the facility plan is deficient in some areas. Facility personnel may only provide training for Consortium programs if they agree to follow the curriculum and are a co instructor with the Consortium Training Center Personnel.

This 24-hour course incorporates a variety of teaching methods to meet varied learning styles. Material presentation, discussion, small-group activities, exercises, demonstrations, and site simulations are used to present material. These varied formats are designed to meet the different types of learners who might be present in your courses. The Instructor Guide provides step-by-step instructions for presenting the material. Each chapter of the Instructor Guide includes information such as time requirements, teaching methods, required materials, suggested instructor preparation, minimum content requirements, issues which may arise, and reference materials. Every instructor should be familiar with the material in the Student Manual, the Instructor Guide and the content he/she is teaching. In addition, instructors should be familiar with the OSHA Standard, 29 CFR 1910.120 and other applicable standards mentioned in the text.

Carefully review the section(s) of the Instructor Guide which correspond to the topics you are teaching before preparing your lesson.

A sample Agenda follows (24 contact hours does not include breaks):

Day 1		
	Intro (includes Pretest)	1 hour
	Rights and Responsibilities	1 hour
	Break	¼ hour
	Hazard Recognition	2 hours
	Lunch	½ hour
	Health Hazards	1 ¾ hours
	Break	¼ hour
	Monitoring	2 hours
	Review	¼ hour
Day 2		
	Review	¼ hour
	Respirators	3 ¾ hours
	Comfort break midmorning	¼ hour
	Lunch	½ hour
	CPC/Levels of Protection	1 hour
	Decon	2 ¾ hours
	Comfort break midafternoon	¼ hour
	Review	¼ hour
Day 3		
	Work practices	2 ½ hours
	Emergency Response	1 ½ hours
	Simulations	3 hours
	Review	¼ hour
	Closing (includes Posttest)	¾ hour

INTRODUCTION

Time Requirement: 1 hour

Number of Instructors: 1

Materials

- Blackboard, marker board or easel with paper or white board
- Chalk or Magic Markers
- Sign-in sheets
- Registration Materials (if not collected prior to the course)
- Student Manuals
- Other course resource materials
- Handouts
- Course Agenda
- Pre-tests
- Pencils and notepaper for trainees

Chapter Objectives

When participants have completed this chapter, they will be better able to:

- Identify the term ‘hazardous material’
- Identify the term ‘hazardous material emergency’ using actual case studies for application
- Identify reasons why an Emergency Response Plan is needed.

Presentation of the Session

This session can be presented as follows:

1. Welcome the class.
    - Trainees can be welcomed by an employer, union representative, or similar person in support of the program if it is held on-site.
    - Have participants sign in.
    - Explain why the program was created, and reference HAZWOPER.
2. Introduce the program presenters:
    - The training institution conducting the training.
    - The Midwest Consortium
    - The instructors who are present.
3. Introduce the trainees.
    - Ask the trainees to introduce themselves to the class. Have them briefly tell their name, where they are from, their experience with hazardous materials, why they are taking the class and how they will use this training.
    - Start a list of hazardous materials that participants may encounter during emergency response. It will be helpful to refer back to this list several times during the course.
4. Describe the program activities.
    - Present the overall goals of the class, which are to learn about:
        - Risks of hazardous materials.

- Possible outcomes of an emergency.
- Ways to recognize hazardous materials.
- Your role as an operations-level responder.
- The need for other resources.
- Basic hazard and risk-assessment techniques.
- Selecting and using proper protective equipment.
- Basic hazardous materials terms.
- Basic control, containment, and confinement procedures.
- Basic decontamination procedures.
- Standard operating procedures and incident termination.

- When participants finish they will be better able to:
  - Size up a scene.
  - Work within the system to set up for response actions.
  - Use protective equipment.
  - Perform certain basic response actions.
- Go through the agenda.
- Explain training policies (e.g., smoking, breaks, phone policies, etc.).
- Collect medical release forms, if not done previously.
- Explain why evaluation forms are part of training.

5. Administer the pretest.

6. Collect the pretest.
   - Ask participants if they have any questions.
   - Encourage participants to feel free to ask questions throughout the training presentations.

What Is a Hazardous Material?

Case Studies

Case studies help to make the concepts that are presented relevant to participants' own experiences. Possible case studies that may be used might include those in the participant manual, case studies from the employer for contract programs, cases from the instructor own experience, or other events found on the internet. A good source for reports, photos and videos is the US Chemical Safety Board website (www.csb.gov).

The Employer's Emergency Response Plan

Questions you may be asked

Many trainees will question why the definition of hazardous materials emergencies doesn't include all emergencies. The instructor should be prepared to discuss other hazardous situations which may arise in the work place but don't meet the HAZWOPER definition of an emergency.
It is likely that a few trainees will want detailed questions answered during the initial module. This section is meant to be an overview, with details to follow in later modules.

Review Questions—Introduction - Answers

1. Why is planning for hazardous materials emergencies important?
   It is important to plan for hazardous materials emergencies because it will lessen the chance that you and others will be injured or become ill. Planning allows for the quick execution of response techniques that can also lessen property damage.

2. What are some things that are done to prepare for hazardous materials emergencies?
   To prepare for a hazardous materials emergency, first get trained. Learn about hazardous materials and situations. Then, create Emergency Response Plans suitable for your workplace. Build relationships with the local fire department, police, and other emergency response personnel that might be of assistance.

RIGHTS AND RESPONSIBILITIES

Time Requirement: 1 hour

Number of Instructors: 1

Materials

- Blackboard, marker board or easel with paper or white board
- Chalk or magic markers
- Student Manuals
- 29 CFR 1910.120 (no longer an appendix; prepare copies as handout)
- Other course resource materials
- Handouts
- Course Agenda

Chapter Objectives

When participants have completed this chapter, they will be better able to:

- Identify two relevant Federal agencies that promulgate and enforce health and safety regulations.
- Identify applicable federal health and safety regulations that protect emergency responders.
- Describe key rights and responsibilities workers have under the OSHAct.

Teaching Methods

- Presentation
- Small-group activity

Suggested Instructor Preparation

- Review the participant manual.
- Review the HAZWOPER standard.
- Review relevant sections of the OSHAct.
- Review whistleblower guidance at OSHA website.
- Develop background if contract program: has there been an OSHA inspection?
- Review OSHA reporting requirements, effective 01/01/2015 in states where enforcement is federal (https://www.osha.gov/recordkeeping2014/OSHA3744.pdf); if in a state-plan jurisdiction, determine implementation date by contacting OSHA.

Presentation of the Session

This session can be presented as follows:

Minimum Content Requirements

The following are minimum content objectives for the Rights and Responsibilities module:

- SARA materials
- HAZWOPER training requirements for awareness and operations level personnel
- OSHAct worker rights and responsibilities
- OSHAct employee responsibilities

Questions you may be asked

- Many trainees will question why other rights or responsibilities are not in the law. Trainers should be prepared to facilitate this discussion.
- It is likely that employees may state that employers are not meeting their responsibilities. Trainers need to know in advance the mechanism for health and safety problem resolution if trainees are in a contract program. If open enrollment, the trainer should be prepared to facilitate a discussion of how to approach problem resolution.

Exercise 1 - Worker and Employer Rights and Responsibilities - Answers

T or F	1.	The employer must pay for all health and safety equipment required by OSHA standards.
T or F	2.	OSHA can fine workers for violating OSHA standards.
T or F	3.	The employer doesn't have to correct problems cited by OSHA until all legal Appeals are exhausted.
T or F	4.	OSHA violations can be issued when workplace hazards are causing serious physical harm.
T or F	5.	If OSHA conducts an inspection of the work site, the union or employee representatives must be paid for time he or she spend on the walk-around, according to OSHA regulations.
T or F	6.	OSHA has the right to enter the workplace and conduct an inspection at any time, whether the employer wants it or not.

T or F	7.	The “general duty clause” can be used by OSHA if a serious hazard exists but no specific safety and health standard covers the problem.
T or F	8.	According to the OSHAct, the employer and the employees have an equal duty to provide a safe and healthful workplace.
T or F	9.	If employers receive an OSHA citation, they must appeal it within a certain number of days or the citation becomes final.
T or F	10.	The OSHA 300A form must be posted during the months of February, March, and April and presents the annual summary of recordable employee injuries.

SARA

- SARA Title I resulted in the HAZWOPER regulation.

HAZWOPER—Hazardous Waste Operations and Emergency Response

The specific requirements for training of industrial emergency responders at the operations level are found in (q)(6)(ii).

Exercise 2—Using HAZWOPER - Discussion

Help participants to answer the following questions using 29 CFR 1920.120(q)(6)(ii) and discuss the implications of their answers.

1. Does this definition fit your job? Yes or No

2. Based on this paragraph, what training is required?

Training Requirements of HAZWOPER

Emergency responders at the operations level are trained to respond in a defensive fashion without actually trying to stop the release. Their function is to confine the release from a safe distance, keep it from spreading, and prevent

exposures. Additional training at the technician level is required to actually stop the release.

OSHAct

Some key points:

- The employer has the sole responsibility to provide a safe and healthy workplace.
- The employer must pay for all required safety equipment, except for that which can be worn off the job, such as prescription safety glasses and safety shoes.
- Employees have the right to be informed about hazards in the workplace. (now considered by OSHA a Right to Understand)

OSHA

State and local government employees are not covered by federal OSHA, but are covered by state-run health and safety programs if they exist in their state. OSHA cannot fine federal agencies, but it does monitor them and responds to federal employee complaints. Health and safety programs at federal agencies must meet the same standards as OSHA-regulated programs in private industry.

OSHA does not cover:

- The self-employed;
- Family members of farm employers who have no outside employees;
- Workplaces regulated by another Federal agency, such as the Mine Safety and Health Administration, the Federal Aviation Administration or the Coast Guard.

Review Questions—Rights and Responsibilities - Answers

1. List two employer responsibilities under the OSHAct.

a. Furnish safe and healthy job and environment
b. Comply with OSHA standards

2. List two employee responsibilities and two employee rights under the OSHAct. (must list two rights and two responsibilities):

a. RIGHT: To request an inspection.
b. RIGHT: To participate in an OSHA walk-around
c. RIGHT: To be a witness or to give information
d. RIGHT: To be informed of imminent dangers
e. RIGHT: To be told about citations
f. RIGHT: To appeal about OSHA performance
g. RIGHT: To appeal abatement date
h. RIGHT: To have a closing conference
i. RIGHT: To know of health hazard exposures
j. RIGHT: To have access to OSHA record
k. RIGHT: To participate in development of new standards
l. RIGHT: To review a citation procedure when a citation is not issued
m. RIGHT: To file a discrimination complaint
n. RESPONSIBILITY: To abide by established safety rules
o. RESPONSIBILITY: To wear and/or use required safety equipment
p. RESPONSIBILITY: To bring safety/health concerns to attention of management

3. List five training requirements for operations-level emergency responders.

Any 5 of:

a. Previously fulfilled awareness requirements
b. Know basic hazard and risk assessment techniques
c. Select and use proper personal protective equipment that is provided
d. Know basic hazardous materials terms
e. Know basic control, containment, and/or confinement operations
f. Know basic decontamination
g. Understand relevant standard operating procedures
h. Know termination procedures

HAZARD RECOGNITION

Time Requirement: 2 hours

Number of Instructors: 1

Materials

- Blackboard, marker board or easel with paper or white board
- Chalk or magic markers
- Student manual
- NIOSH Pocket Guide and other electronic resources, such as WISER, New Jersey Fact Sheets, CAMEO Chemicals, etc.
- Hazard Communication standard
- Determine level of HazComm knowledge. If 2012 Hazard Communication Standard training is needed, the HCS 2012 exercise may be used.
- Emergency Response Guidebook
- Blackboard, marker board or easel with paper.
- Safety data sheet (SDS) for one or more chemicals of interest

Chapter Objectives

When participants have completed this chapter, they will be better able to:

- Identify factors contributing to the major types of hazards that may result in a response.
- Identify information on hazardous materials placards and labels, and from container shapes.
- Use the *Emergency Response Guidebook* (ERG) to identify different types of hazardous materials.
- Identfiy the types of information on shipping papers and SDSs.

Teaching Methods

- Presentation
- Small-group activity

Suggested Instructor Preparation

- Review the participant manual.
- Review the HAZWOPER and Hazard Communication standards.

Presentation of the Session

This session can be presented as follows:

Minimum Content Requirements

The following are minimum content objectives for the Hazard Recognition module:

- Emergency recognition

- DOT system
- Hazard Communication, HMIS, NFPA, and/or other labeling systems; this can be limited to what is used at the facility for contract programs
- Container shape materials (note: for contract programs, only those relevant to the facility may be covered, if desired)
- SDS materials
- Heat stress and confined space information

Questions you may be asked

- Trainees may ask why labels at their facility are not like HazCom, NFPA or HMIS. Trainers should review 1910.1200 and be prepared to discuss alternatives. Also questions about labeling of pipes and small containers may be raised; both are addressed in 1910.1200. Hazardous wastes are exempted from 1910.1200. This may cause some confusion for trainees. Under 1910.120, employers must provide training about known health hazards of wastes, but are not required to provide an SDS. Trainers should be prepared to facilitate a discussion about how workers can obtain information about health hazards of wastes which are found at the facility.
- Trainees (or employers) may state that they know every hazard at the site and that training about the DOT system or other labeling systems and/or recognition of unknown hazards in unnecessary.
- The trainer should be prepared to discuss the possibility of the following: A truck delivering chemicals to the plant may include chemicals other than those used at the facility. What happens if a spill occurs from the trailer on plant grounds?
- What happens if bulk material is transferred into an incorrectly labeled container?
- If employees may be called upon to respond to an emergency at a remote site, how will they recognize hazards at the scene?

- Other scenarios also exist. It is also important to note that hazard recognition training is required by HAZWOPER.

Recognizing an Emergency

Emergency responders should become familiar with the plant Emergency Response Plan (ERP) before an emergency occurs.

Types of Hazards

For contract programs, tailor discussion of hazards to the hazards specific to the plant.

For open-enrollment programs, ask participants which hazards are present at their workplaces.

Recognizing Hazards

Here we use the National Fire Academy 6-point scheme to categorize information collection: occupancy, DOT placards and labels, markings and colors including other label systems, container shapes and sizes, shipping papers and SDSs, senses.

Labels, placards and documents that can be used to identify hazardous materials will be covered. Ask:

- What labels and placards are you familiar with?
- Have you ever used documents such as shipping papers or SDSs?
- How are labels, placards and documents useful in emergency response?

DOT Placards and Labels

- Review how to use the DOT Emergency Response Guidebook (ERG). Provide a copy of the book to each trainee.
- Display DOT placards and labels. Discuss the meaning of colors, words, symbols and numbers on the placards.
- Select a DOT placard, and lead the class through identification of one chemical. Have the page numbers ready to give to the class. Tying in the discussion to an actual incident could make the identification more exciting; read the Numbered Guide information or hit the important points.

Markings and Colors

Labels may be found on small containers or large stationary tanks of chemicals. Colors, symbols and numbering systems are used to identify hazards.

National Fire Protection Association (NFPA)–704 System

- Display an NFPA label. Discuss the meaning of colors, numbers and special symbols.
- The higher the number, the higher the hazard. This is the opposite of the HCS 2012 system. However, HCS category numbers do not appear on labels. They will be found in Section 2 of the Safety Data Sheet (SDS) for chemicals.

Hazard Communication Standard labels

- Labels consistent with the 2012 Hazard Communication standard are likely to be found on chemical containers coming from the manufacturer.
- Container labels under HCS 2012 have certain required elements, including a pictogram. The use of pictograms is a quick way of communicating the hazard(s) of a substance.
- Signal words can only be “Danger” (more hazardous) or “Warning”.
- Hazard classes are found in Appendix C.4. of HCS 2012.

The 2012 update of the Hazard Communication standard requires that any alternative label must be consistent with the HCS2012--no conflicting hazard warnings or pictograms are allowed.

The Hazardous Materials Information System (HMIS)

Display an HMIS label. Discuss the meaning of colors, numbers and letters. Like the NFPA system, the higher the number, the higher the hazard.

Letter codes (A-K, X) indicate PPE required.
An asterisk in the first box next to “Health” indicates a chronic health effect. The target organ is designated by an icon. Physical hazards are also indicated by icons.

Container Shapes and Sizes

It is important to be able to determine contents of tanks, trucks and railcars that may be at the workplace in order to provide information to plant management and fire service and other responders.

Shipping Papers and Safety Data Sheets (SDSs)

Discuss other sources of information.
Review in the Student Manual:

- Shipping papers for hazardous material-required by DOT
- Manifest forms-required by the EPA and DOT
- Waste Profile Sheets-analysis of hazardous waste
- SDSs – required by the Hazard Communication standard to be available in the workplace.
- Documents are important resources for recognizing health and safety hazards.
- Discuss the limitations of documentation.

Sense

Ask,

‘Are all senses to be trusted?’

No

‘What limitations are there to relying on senses?’

Color blindness
Ability to smell differs among people
Smell affected by colds or other infections
Sense of smell can be overwhelmed (hydrogen sulfide)
Skin may be protected by hair or clothing

Recognizing Physical Hazards

Ask : "What are some examples of physical and safety hazards?"
List responses. If the trainees don't list all of them, as you discuss each hazard, add those they missed. Display the list where the whole class can see it.
Refer back to the list of hazards generated at the beginning of the course.

Radiation

Radiation is colorless, odorless and tasteless. It can only be measured with specialized instruments. To minimize exposure, limit the time near the source, increase your distance away from the source, and use appropriate shielding for the type of radiation involved.

Electricity

Useful information from OSHA may be found at:
https://www.osha.gov/SLTC/electrical/index.html.

Heat and Cold

OSHA recommends “Water, rest and shade” to avoid heat-related illness. You may find helpful information at: http://www.osha.gov/SLTC/heatillness/index.html.
Chemical protective clothing (CPC) and respiratory protection increase heat stress. It may be necessary to reduce the duration of work activities in CPC and respiratory protection during warm or hot weather.
When working outdoors, winter cold may be a problem. Useful information may be found at: https://www.osha.gov/as/opa/cold_weather_prep.html.

Slips, Trips, and Falls

The fall-protection construction standard, 29 CFR 1926.501, is always one of the most-frequently cited OSHA standards for violations. OSHA’s ladder safety construction standard, 29 CFR 1926.1053, is also one of the top ten for citations. An OSHA ladder safety pamphlet is available at:
https://www.osha.gov/Publications/OSHA3625.pdf.

Steam and Chemical Clouds

Anything that looks like a cloud of steam should be avoided. Steam piping and steam-heated equipment may be hot enough to cause serious burns.

Confined Spaces

Over half of fatal incidents in confined spaces involve rescuers.

Stress

An operations-level emergency responder should respond only in a defensive mode. However, the responder may witness injury that causes stress. Refer to the WMD module on Stress Management Awareness, and NIOSH materials on stress management for emergency responders.

Exercise— Hazard Recognition - Answers

The instructor must be prepared to facilitate discussion on differences between various sources of information, and underscore the need for information gathering as part of preplanning. If you select a compound that is used at the facility, prepare answers to the questions in advance.

The Problem

1. What kind of information should be known about remover/thinner before there is an emergency?

   What's in it?
   What to do if there's a spill?
   How to get more information.
   What protective equipment is needed?
   Are storage vessels appropriately labeled?

2. In the resources provided, what information can be found on the topics listed in Question 1?

   1-methoxy 2-propanol; guide #129, ID # 3092.
   See SDS and other references.

3. Do all the sources contain information on the topic?

Resources vary in what information they include. Some are more detailed than others. Some are more geared to emergency response than others. Ask participants to share what they observed.

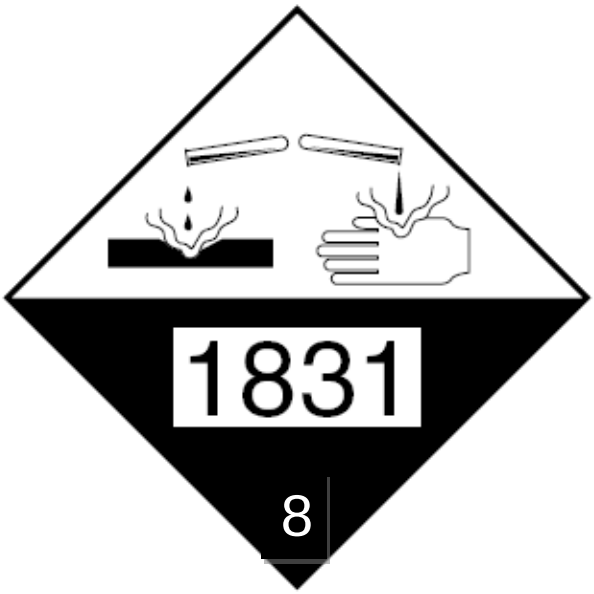
Review Questions—Hazard Recognition

1. List major types of health and safety hazards.

Chemical, biological, physical

2. On the placard provided, what information is shown?

Corrosive, class 8; sulfuric acid, fuming



3. What do the following pictograms mean?



Exclamation mark

Health hazard	*(irritant, sensitizer, acute toxicity, narcotic, hazardous to ozone)*	*Oxidizer*
_____	_____	_____

4. What do the following symbols indicate?

Radioactive	*Do not use water*	*Flammable*
_____	_____	_____

5. Why is a container shape important?

Container shape gives a clue to what is inside and what pressure it might be under.

6. List major types of information contained on an SDS.

Identification, Hazard identification, Composition/information on ingredients, First-aid measures, Fire-fighting measures, Accidental release measures, Handling and storage, Exposure controls/personal protection, Physical and chemical properties, Stability and reactivity, Toxicological information, Ecological information, Disposal considerations, Transport information, Regulatory information, and Other information

7. Where are shipping papers kept in a truck when sitting in the driver's seat? When leaving the vehicle?

Shipping papers are kept in the cab of trucks when the driver is present. When the shipment arrives, a copy of the papers is given to plant personnel.

8. What are several reasons why physical hazards exist during an emergency?

There are many situations where physical hazards may exist during an emergency: a radioactive material may leak from a drum or other container; electrical wires may be downed, causing trip hazards as well as

the risk of electrocution. Other hazards may result from heat or cold, steam, confined spaces, or stress.

HEALTH HAZARD RECOGNITION

Time Requirement: 1 ¾ hours
Number of Instructors: 1

Materials

- Chalkboard, marker board or easel with paper or white board
- Markers
- Masking tape
- Student Manual
- NIOSH Pocket Guide

Materials unique to each exercise are:

- Wall charts or slides of organ systems
- Medical dictionary

Chapter Objectives

Objectives for this chapter are:

- Define chemistry terms used to evaluate how a chemical will behave.
- Identify potential effects of exposure to chemicals in the workplace.
- Identify ways to limit exposure.
- Describe key parts of medical surveillance.

Suggested Instructor Preparation

- Read the chapter in the Student Manual.
- Prepare an outline to follow. Different groups will have different needs. It is better to respond to their concerns than to follow an outline rigidly. Refer back to the list of hazards generated at the beginning of the course.

Minimum Content Requirements

The following are minimum content requirements for this section:

- Chemical and physical characteristics
- Fire triangle
- Explosive limits
- Chemicals and the body
- Medical surveillance

Questions you may be asked

- Are the chemicals at work harming me? The instructor should be prepared to discuss work exposures in relation to other causes of major diseases, i.e. the many causes of lung cancer. The trainee should be referred to an occupational medicine clinic for detailed information. Specific references could also be discussed.
- How can I get exposures measured? Company and union resources should be discussed. Filing an HHE or OSHA complaint is a last resort.
- Can the results of medical surveillance be used to fine me? This is a common concern of workers. The instructor should be prepared to discuss union and OSHA avenues to resolve this concern.

- How do you know if a physician specializes in occupational medicine? Few physicians are “occ docs”. Be prepared to give the names or locations of “occ docs” in your area.
- Which type of radiation is dangerous? All radiation is dangerous. Stress, the concepts of time, distance, and shielding.
- Can urine collected for a required chemical analysis be used for a drug screen? Instructors should be aware of company practices. Refer trainee to their union or management representative.

Presentation of the Session

This session can be presented as follows:

Chemical Reactions

When you begin your presentation:

Ask "What are some chemicals used at your facility or that you have experience with?’ List them.

Ask "In your work have you ever experienced or observed unexpected chemical reactions?"

- Possible answers include:
  - Acids degrading stainless steel or other metals (oxidation of metals, corrosion)
  - Blew a safety valve (pressure build-up due to temperature increase or chemical reaction)
  - Explosion (exceeded the Lower Explosive Limit and generated some source of spark)

- Ask "What chemical properties do you think are important to know when responding to an emergency?"
- List answers. As you present, add any properties the trainees missed.
- As you introduce each chemical property, ask the trainees if they can give an example of a chemical that is flammable, has high vapor pressure, etc. Keep them thinking and participating.

Chemical and Physical Characteristics

- Ask "What chemical properties do you think are important to know when responding to an emergency?"
- List answers. As you present, add the properties the trainees missed.

- As you introduce each chemical property, ask the trainees if they can give an example of a chemical that is flammable, has high vapor pressure, etc. Keep them thinking and participating.

Throughout this discussion, relate the importance of each property to emergency response, as shown in the manual.

As time permits, the videos listed in the following paragraphs may be helpful in showing selected chemical properties.

Freezing/Melting/Boiling Points

Participants should be familiar with melting or freezing point from observing the behavior of snow and ice.

Hydrogen Ion Concentration (pH)/Corrosives (Acids/Bases)

Ask trainees to give examples of acids and bases. Have trainees look at the pH Scale in the Student Manual and talk about strong acids and strong bases (alkalis) as corrosive.

A small amount of water added to concentrated acid can generate a lot of heat, causing splashing. When diluting acid, it is always safer to add the acid to the water than to add the water to the acid. Hence the saying: Always Add Acid.

Flash Point/Flammable, Combustible, Ignitable/Autoignition Tempeprature

Point to the examples in the Participant Manual to show how very different these can be for common chemicals.

Oxidizers

In this video, http://www.youtube.com/watch?v=m48IihPKkPY (running time: 0:40), the maker of the video mixed several oxidizers with sugar. From right to left, they are potassium perchlorate, sodium nitrate, potassium permanganate and potassium nitrate. Note how high the flames are. Would sugar alone burn so hot? Note that bromine, chlorine and fluorine can also be oxidizers.

Solubility in Water/Specific Gravity

An entertaining video of a young man demonstrating different specific gravities can be found on YouTube at: http://www.youtube.com/watch?v=IIEFDo0fAfo (running time 2:11). The reason his experiment works is because his two glasses fit together tightly; vegetable oil is not soluble in water; and the specific gravity of the water (dyed green) is higher than the specific gravity of the vegetable oil.

Ask the trainees for examples of substances that will float or sink in water.

Relative Gas Density

Sulfur hexafluoride is heavier than air (RGasD = 5.11). In a short YouTube video (http://www.youtube.com/watch?v=1PJTq2xQiQ0, running time 0:30), an aluminum “boat” floats on a sea of sulfur hexafluoride, and is then sunk by filling it up with the gas, much as you might fill a boat with water and sink it. Emphasize that gases that are heavier than air can be very dangerous if they leak, as they will accumulate in low places.

Vapor Pressure

Refer to the illustration in the Manual.

A video showing a vapor pressure experiment can be found on YouTube at: http://www.youtube.com/watch?v=cMAYcwCjgqo (running time 3:14, but they repeat the experiment several times, so you can see the whole experiment in 1 minute). When the water in the aluminum can heats up, the vapor pressure of the water increases until it reaches the same air pressure as the room. At this temperature (the Boiling Point), the water boils and fills the can with warm water vapor. Plunging the can into ice water suddenly drops the vapor pressure inside the can, so that the air pressure of the room can crush the can.

This can actually happen when working with chemicals. If a container of a hot chemical is sealed up tight, and the temperature surrounding the container drops, the container can start to collapse.

Viscosity

A very brief video showing the difference between a high viscosity and a low viscosity liquid may be found at: http://www.youtube.com/watch?v=vNzTYzjLgKE. This demonstration could easily be done live, using water and corn syrup, molasses or honey.

Volatility

Relate volatility to material loss to the air and to displacement of air.

Toxicity

Ask participants ‘What makes a chemical toxic?’ Refer to the list of chemicals for their worksite.

Note that OSHA regulates 400 toxic substances; the US EPA’s Toxic Substance Control Act (TSCA) Chemical Substances Inventory lists over 62,000 substances; and Safety Data Sheets are available for over 100,000 substances. (https://www.osha.gov/SLTC/hazardoustoxicsubstances/)

Fire Triangle: Fuel, Oxygen, and Heat/Explosive Limits

The example of a gasoline engine is a good way to explain these topics.

A video explaining the fire triangle and explosive limits can be found at: http://www.youtube.com/watch?v=BRVCbxr-vKs (running time 3:53). A much shorter, very retro (1947) demonstration of explosive limits is found at: http://www.youtube.com/watch?v=MWkG_sJ1i2M (running time 0:54). Note that oxygen is present in the air, fuel in the gasoline vapors, and a spark is provided by the hand-held device to provide all three sides of the fire triangle.

Radioactivity

The four forms of ionizing radiation (radioactivity):

- Alpha
- Beta
- Gamma
- Neutron

The use of instruments to detect radioactivity will be discussed in the Monitoring chapter.

For Protection from Radiation: time, distance, shielding – the right type of shielding depends on the type of radiation involved.

Chemicals and the Body

- Ask, "What is a response to exposure?"
- If no one answers, use the example of alcohol or inhaling second-hand smoke.
- Using the figures in the manual, discuss chemicals identified by participants as ‘important’ and/or ‘toxic’. Illustrate routes of entry and sites of action using these same figures.

Possible Health Effects

Acute Effects

- Ask "What is an acute exposure?"
- If no one answers, write the answer (while speaking) where all can see.

- Discuss acute exposures and health effects from examples provided by individuals in the class or your own experience. Talk about the dangers of acute exposures to chemicals. Most of the exposures discussed during the previous exercise were probably acute exposures.

If they don't seem to get the point:

- Ask "What toxic effect does alcohol have on humans?"
- Trainees usually mention liver damage (chronic effect) rather than central nervous system effects (acute effect).

Ask, "What is meant by saying acute exposures can be prevented by the chemical's good warning properties?" Some examples:

- Severe irritants of eyes, throat, airways, and skin
- Solvents-central nervous system effects
- Smells bad; the sense of smell can be unreliable-don't depend on your nose.

Emphasize that warning properties are a very unreliable way of avoiding exposure.

Ask the trainees to name some chemicals that don't have good warning properties:

- Carbon monoxide (CO) (210 times the affinity for hemoglobin that oxygen has.) CO also binds much tighter than oxygen.
- Lead exposure and heavy metals in general
- Asbestos
- Hydrogen sulfide – although it smells bad, your nose gradually becomes insensitive to the smell.

This format can be used throughout the health effects section with success. Challenge the trainees by asking questions. If no one speaks, answer your own question while writing the answers where all can see. If you have the trainees "hooked" by being interactive, they will listen and feel free to ask any questions that pop into their heads.

<u>Chronic Effects</u>

Ask "What is a chronic exposure?"

Write some examples of chronic exposures where all participants can see.

"What do you worry about from chronic exposures?"

- Cancer
    - Participants may have a high level of concern about cancer.
    - Ask, “Do you know anyone who developed cancer after working with chemicals?”
- Lung disease (from fibers, dusts, etc.)

- Damage to skin, eyes, liver, nervous system, kidneys, heart, and reproductive system

Emphasize that some exposures can cause either acute or chronic effects.

Factors That Influence the Body's Response to Exposure

Using the example of alcohol, ask the participants to imagine that you serve everyone in a large group a jigger of whiskey and you all drink it together at one time. (What route of entry is this?)

- Dose-response: The more you drink, the greater the effects.

Imagine that you keep repeating the process until someone appears silly or unsteady. (Is this an acute or a chronic effect?) At this point, some individuals still don't appear drunk. Imagine that you keep repeating the process until half of the people pass out.
There still will be one or two people who don't appear drunk.
You should emphasize that each person has his or her own dose response to alcohol, and the same is true for chemicals.

- Ask "Why do you think people respond differently to alcohol and other chemicals?"
- Some reasons are:
    - Heredity (includes sensitivity to allergens, metabolism, biochemical mechanisms, susceptibility, etc.).
    - Gender.
- Body weight.
- Age.
- Health condition.
- Personal habits.
- Trainees may come up with other factors.
- Refer to the first illustration, *Health Effects: What Affects Your Body?* In the Student Manual, for local and systemic effects and target organs.
    - Refer back to exposures and effects mentioned previously.
- Refer to the second illustration, *Health Effects: How Does Your Body React?,* for possible symptoms of exposure and adverse health effects.

Effects of Chemicals on the Body

- Ask whether the chemicals you have been talking about have local effects on contact (skin, eyes, airways) or get into the bloodstream (systemic).
- Ask "What is the difference between local and systemic effects?"
- Discuss what is meant by chemicals having target organs.
- Points to be emphasized:
    - Chemicals have an organ as a target in causing cancer (liver, skin, etc.).
    - The more frequent the exposure to chemical carcinogens, the shorter the time to develop cancer.
- Wall charts, slides, or a take-apart model may be used to illustrate this section.

Medical Surveillance

Key points:

HAZWOPER requires medical surveillance for certain groups of workers exposed to hazardous materials during emergency response.

Employers are required to pay for required medical exams.

The employer must keep records of medical exams and exposure monitoring until 30 years after the worker's employment ends.

The employee should report all work-related injuries and illnesses immediately.

Medical Emergencies during a Mass Casualty Incident

"Emergency medical treatment and first aid" is a required section of the Emergency Response Plan.

Review Questions—Health Hazard Recognition - Answers

1. Describe the importance of the following terms:

    Boiling Point - The temperature at which a liquid changes into a vapor or gas. Chlorine's boiling point is -29 degrees Fahrenheit. When the air temperature is less than this, chlorine will remain a liquid and the emergency is not so hard on the respiratory system. Most of the time, in most places, the air temperature will be above this, rendering chlorine a deadly gas. The few degrees difference between -30 degrees Fahrenheit and -28 degrees Fahrenheit is a big one when we're talking about chlorine emergencies.

Flammability - *The potential for a substance to catch fire. Flammability is based off the Flash Point. It tells you how much danger there is of a fire.*

Relative gas density - *Tells you whether a gas is lighter or heavier than air. The RGasD of gasoline is 4.40, which tells you that it is heavier than air. If it is spilled, you would want to get everyone to higher ground because the gas would pool in low-lying areas. If, on the other hand, ammonia spilled inside a building, you would want everyone to get down on the ground because its RGasD of 0.59 tells you that it would rise.*

2. What are the most common ways that substances enter the body?

The most common ways substances enter the body are through the skin (absorption), mouth (ingestion), lungs (inhalation) and injection (skin puncture).

3. What are some possible health effects of exposure to hazardous materials?

Possible health effects of exposure to hazardous materials can range from choking, coughing, nausea, dizziness or burning (all acute) to cancer, liver disease, impotence, mental deterioration or lead poisoning (all chronic).

4. Who is legally required to be included in medical surveillance?

Members of official hazardous response teams, emergency response personnel who have signs or symptoms resulting from exposures, workers who wear respirators more than 30 days per year and workers whose exposure exceeds exposure limits for more than 30 days in a year.

5. When should medical examinations be performed?

Medical examinations should take place prior to a new job assignment, on a routine basis, at the termination of job or assignment, and/or if the employee shows signs or symptoms related to exposure.

MONITORING

Time Requirement: 2 hours

Number of Instructors: 1

Materials

- Chalkboard, marker board or easel with paper or white board
- Markers
- Table
- Student Manuals
- Examples of monitoring instruments and/or a personal sampling train

Chapter Objectives

When they have completed this chapter, participants will be better able to:

- Identify why and how the work environment is monitored.
- Identify some hazards that can be monitored.
- Identify steps taken to monitor the scene of a hazardous materials emergency.

- Identify the uses of different types of monitoring equipment during a response.
- Demonstrate the use of a monitoring device and record the results.
- Evaluate health and safety of a situation using monitoring data.

Teaching Methods

- Presentation
- Demonstration
- Small-group activity

Suggested Instructor Preparation

- Review the Monitoring chapter in the Student Manual.
- Review the MWC Exposure Monitoring Participant and Facilitator Guides.

  Be prepared to supplement this manual with participant-specific instrumentation information.
- Review this section.
- Assemble monitoring equipment for demonstration.
- Review OSHA standard 1910.1000, Air Contaminants, where PELs are listed.
- Review OSHA standard 1910.1020, Access to employee exposure and medical records.
- Review facility SOPs for monitoring, confined-space entry, lockout/tagout, etc. (contract programs only)
- Prepare lesson plan.
- Review exercises and activities.
- Review manufacturer's information and instructions for use, maintenance, and storage of equipment used during module.
- Prepare Lab data sheets

Minimum Content Requirements

The following are minimum content objectives for the Monitoring section:

- Uses of monitoring equipment
- Exposure levels
- Explosive limits
- Demonstrations of available equipment
- Monitoring at an emergency response
- Monitoring lab

Questions You May Be Asked

1. You should be prepared to discuss safe confined-space entry (CSE) procedures. Be prepared to describe the actions an employee may take if directed to enter a space which she/he feels is unsafe. For contract programs, the CSE program should be reviewed prior to presenting this module. For open enrollment, general approaches of working through union or company health and safety officers should be discussed. You must be aware of the consequences of refusal to work.

2. Trainees may question whether adequate monitoring is done on a routine and emergency basis. For contract programs, reconnaissance will provide you with information about the facility's monitoring program and equipment.

3. Access to monitoring information may be a new concept for many individuals. How to request this information and what to do with it (keep it with personal medical records, provide it to private or union occupational medical doctor) should be discussed.

Presentation of the Session

This session can be presented as follows:

The Importance of Monitoring

Introduce this section by asking: "Why would you want to monitor in a response?" List responses where the whole class can see them. Be prepared to fill in any gaps not mentioned. Refer back to the list generated at the beginning of the class and to examples in the student manual.

Ask: “When would you want to monitor?”.

Ask: "How are the results of these (refer to the list) reported?"

Uses for Monitoring Data

Emphasize that conditions can change rapidly during an emergency response.

What Can Be Monitored in the Air?

Review the following:

1. Oxygen Deficiency
2. Oxygen Enrichment
3. Fire and Explosion Hazards
4. Toxic Chemicals

Measures of Concentration

Go over the examples of measures of concentration given in the student manual.

Key points:

- Emphasize that 1 ppm, 1 mg/m^3 or 1 f/cc are small concentrations. Some chemicals are hazardous even at these low concentrations.
- Percents are used for higher concentrations. A solution of 1% would be 10,000 ppm.

Exposure Limits

Points to be emphasized:

There are several sources of occupational exposure levels (including many company-designated levels), but only PELs are legally-enforceable.

PELs are often not the most protective exposure limits.

Many limits are expressed as an 8-hour time-weighted average.

Even though an exposure may be high for a short period of time, the 8-hour TWA may not be exceeded. See Tables Z1 and Z2 in 29CFR1910.1000 for STEL or C values.

Important Points to Remember_About Exposure Limits

All releases should be treated as hazardous material releases until it is verified that they are not hazardous.

Explosive Limits

Explosive limits are much higher concentrations than exposure limits. Different instruments are needed to measure for the two.

Types of Air Monitoring

Discuss personal and area monitoring and the advantages/disadvantages of each method, especially the need for area, direct reading instruments for many responses, or personal alarming monitors for personal exposure:

- Personal sampling
- Area monitoring
    - Direct-read sampling
    - Long-term area monitoring

Monitoring Instruments

Discuss the features of several instruments commonly used in hazardous waste site work, and demonstrate them and/or pass them around the class. Some examples might include:

- Oxygen meter
- Combustible-gas indicator (CGI)
- Length-of-stain tubes
- Personal alarm systems
- Photoionization Detectors(PID)
- Radiation monitor

Sound Level Measurements

Point out that noise measurements are made using a sound level meter for area measurements or a noise dosimeter for personal sampling of an individual worker's noise exposure.

Monitoring at an Emergency

Pre-planning is essential for emergency response. The Emergency Response Plan (ERP) must contain the monitoring plan for emergency response. Emphasize that practicing emergency response is essential for good performance during an actual emergency.

Selecting Monitoring Equipment

- Emergency responders are not responsible for selecting monitoring equipment, in general, but they must be familiar with what instruments are available and how to use them if trained to do so. Training is required for all monitoring.
- Always follow manufacturers' instructions for use and care.
- There is no instrument that can detect every hazardous substance.

Environmental Monitoring

Special training is required to perform testing of water, soil, surfaces, drums, or chemical compatibility.

Monitoring Lab – Instructions

Equipment

- Combustible Gas Meter
- Oxygen Meter (or combined CGI/Oxygen meter)
- Three containers with very low level concentrations of flammable vapors (unknown concentrations)
- Yardsticks, measuring tapes or distance markers for ten-, three- and one-foot intervals from mixture containers or bladders
- Hand-sampling pumps (Draeger™ or MSA™) and length-of-stain tubes for ammonia
- One reclosable container with ammonia and water mixture
- Performance checklists with clipboards and pens for each trainee
- Safety glasses and disposable container for glass

Organization

Divide the class into three teams

Set up a rotation through three stations:

Station A: Ammonia monitoring

- One ammonia/water bladder/container for each team
- A hand-sampling pump and indicator tubes
- A yardstick, ruler or tape markers at one foot from the opening to the container
- Safety glasses and disposable container for glass

Station B: Oxygen monitoring

- An oxygen meter or combined CGI/OXYGEN meter

Station C: Flammable monitoring

- One flammable vapor container
- Combustible gas indicator
- A yardstick, tape measure or markers at one, three and ten feet from the container opening

Each team will conduct the required monitoring at each of the three stations, record the reading, and then move on to the next station.
At each station, the instructor should initialize the checklist.

Instructions to Groups

Station A: Ammonia monitoring

- Leak check the pump
- Break off tube ends and seat the tube at the tube-breaker port on the pump
- Obtain one sample one foot from the container opening
- Repeat step 2 and obtain second sample several inches from the container opening (optional)
- Ideally, all three team members should take the one-foot sample
- Record all reading on the check sheet

Station B: Oxygen monitor

- Turn on monitor
- Properly set controls
- Record current oxygen level
- Optionally, the team members may obtain samples of the oxygen concentration from several areas of the room, or in a stairwell, or near the exhaust pipe of an automobile.

Station C: Flammable monitoring

- Turn on Combustible Gas Indicator
- Calibrate (Zero set) the CGI meter
- Each team member should take three readings: one foot, three feet and ten feet away from the container opening
- Record all three readings

Review Questions—Monitoring - Answers

1. What are two types of monitoring that might be done during an emergency response?

Personal and Real-time(or Area) Monitoring

2. Is an STEL or TWA generally more applicable to emergency responder exposures? Why?

Time Weighted Averages (TWA) are more applicable to emergency responders doing cleanup because they cover the entire work shift. An STEL is only for 15 minutes, and is more suitable to be compared to short-term peak exposures.

3. Match the following.

Gas/Vapor	f/cc
Fiber	mg/m^3
Dust/mist	ppm

4. What instruments are used to test air in a confined space?

Oxygen meter, Combustible-Gas Indicator (CGI) / LEL Meter / Explosion Meter, Toxic gas meter such as for H_2S or CO.

5. Imagine that a combustible-gas indicator gives a reading of 0%. What are the possible reasons for this reading?
   - *Low battery charge*
   - *Meter is turned off*
   - *Mixture is too rich to burn*
   - *Meter is not calibrated.*
   - *Sample error*
   - *Chemical limitation*
   - *There is actually 0% combustible gas present*

RESPIRATORS

Time Requirement:	Presentation – ¾ hour Demonstration and Workshops – 3 hours
Number of Instructors:	2 or more to maintain required ratio

Materials

- Chalkboard, marker board or easel with paper or white board
- Markers
- Student manuals
- NIOSH information on respirators, http://www.cdc.gov/niosh/topics/respirators/
- OSHA Respiratory Protection standard, 29 CFR 1910.134, https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=12716
- Open-space room which will allow groups mobility with protective equipment
- Four tables set up as lab stations
- SCBA units (one per trainee)
- Bottles of breathing air (1 breathing air cylinder per trainee)
- Supplied-air respirator

- Air-purifying respirators
- Manufacturers' instructions for respirators that will be demonstrated and used in the lab
- Fit test hood and materials (if part of program plan)
- Cleaning wipes
- Plastic wash basins (1 per every 2 trainees)
- Soap and disinfectant
- Sponges
- Paper towels
- OSHA training videos on respiratory protection, https://www.osha.gov/SLTC/respiratoryprotection/training_videos.html#video. Do not use all of the recommended videos, and do not show them from beginning to end, because there are many repetitious segments in the videos, but individual videos may be useful to augment certain lectures and demonstrations. They may be viewed on YouTube or downloaded to a computer.

Chapter Objectives

When they have completed this chapter, participants will be better able to:

- Identify situations where respiratory protection is needed.
- Identify types and features of respirators used to protect against exposure to hazardous materials.
- Identify limitations of different types of respirators.
- Demonstrate the inspection, donning and doffing of an APR or SCBA.
- Demonstrate respirator cleaning procedures.
- Identify the key components of a respiratory protection program.

Teaching Methods

The presentation of the respiratory protection section is done by combining lecture, demonstration, and lab and small group activity. You should provide various

examples of the types of respirators. If possible, as the different types of respirators are introduced, pass the facepieces around the room for the students to look at. At the end of the presentation, ask some review questions to sum up the lecture. Long question-and-answer sessions with the trainees should be avoided, because many of their questions will be answered during the lab.

Suggested Instructor Preparation

- Read the chapter on respirators in the Student Manual. See also the MWC Personal Protective Equipment Participant and Facilitator program Guides.
- Prepare lesson plan.
- Review exercises and activities including answers.
- Review manufacturer's information and instructions for equipment used during module.
- Assemble supplies and equipment for lab stations.
- Review 29CFR1910.134, Respiratory Protection.
- For a sample respiratory protection program, see: http://www.osha.gov/dcsp/compliance_assistance/sampleprograms.html#Respiratory Protection.
- For contract programs, review company respirator program

Minimum Content Requirements

- The different types of respiratory protection that are available.
- When respiratory protective equipment should be used and what type
- If performing respirator fit-testing, medical fitness required
- If using Levels A or B, medical fitness-for-training is required
- Care and maintenance of respirators
- Donning and doffing SCBAs and APRs

- Lab (Note: SCBA required for all open enrollment programs and strongly recommended for all contract programs.)
- Respiratory protection program

Questions You May Be Asked

1. Trainees might remark, "We don't do it this way in our plant. So what are we supposed to do?" This question gives you the opportunity to emphasize the need for additional training on company-specific equipment.

2. "What about facial hair? My employer has a 'no beard' policy, and I don't like it."

Emphasize that facial hair prevents a good fit, resulting in exposure to toxic substances.

3. "What do I do when my employer gives me the wrong respirator and tells me that I've got to wear it or else?" Be prepared to facilitate a discussion on strategies to improve the company respiratory protection program through discussions with employee or management representatives. Emphasize that the law requires that employers provide adequate protection from respiratory hazards.

4. “I store my respirator in my locker in a paint mixing room.” Emphasize that anything that lands on your respirator when you’re not wearing it might be inhaled the next time you wear it.

5. “Why do chemical cartridges or filters need to be replaced more frequently when using a PAPR?” The air flow through the cartridges or filters of a PAPR is higher due to the fan moving more air through the cartridges or filters than breathing alone would move. Therefore the cartridges or filters get loaded up with contaminants faster.

Presentation of the Session

The session can be presented as follows:

Use of Respirators for Emergency Response

- Emphasize that PPE is the last line of defense against hazards for routine operations, but is essential for emergency response.
- Refer back to the list of chemicals of interest to the participants. Ask

participants which chemicals may require respirator use during an emergency.

Types of Respirators

- Ask "What considerations should be made when selecting respiratory protection?"
- List responses (for example):
    - Oxygen in the atmosphere
    - Hazardous substances at the work site
    - Exposure to confined space
    - Exposure to extreme temperatures
    - Communication needs
- There is an OSHA training video, “Respirator Types” (available at https://www.osha.gov/SLTC/respiratoryprotection/training_videos.html#video, total running time 16:10), that could be used here. As well as respirator types, the video covers user seal checks, fit-testing and the N/R/P and 95/99/97 systems.

Supplied-Air Respirators (SAR)

Ask "What is a supplied-air respirator (SAR)?"

Discuss the three different modes of operation, and explain why demand mode is the least protective.

<u>Self- Contained Breathing Apparatus (SCBA)</u>

Ask "What is a self-contained breathing apparatus (SCBA)?"

- Discuss key parts of a SCBA including air tank, facepiece, hose, demand regulator, main-line valve, and by-pass valve.
- Demonstrate donning and doffing a SCBA, using the following checklist:
    - Check gauges and valves.
    - Turn on cylinder valve and listen for low-pressure alarm.
    - Put on the tank and harness and adjust straps.
    - Don the facepiece and check the facepiece seal. (Fit-testing will be reviewed later in this chapter.)

- Check the main-line and by-pass valves.

You may have another instructor demonstrate the procedures for donning and doffing the SCBA while the lead instructor narrates the step-by-step procedures.

Air-Purifying Respirator (APR)

- Ask "What is an air-purifying respirator (APR)?"
- Refer to the illustrations of full-face and half-face APRs in the Student manual. Be able to discuss when APRs are appropriate and their limitations.

Filters and Cartridges to Remove Contaminants from Air

Ask "What do you know about filters and cartridges used with APR?"

- Discuss particulate filters and chemical cartridges, including:
  - When not to use chemical cartridges.
  - The meaning of color labels.
  - When to change cartridge.

Other Air-Purifying Respirators

- Discuss characteristics of gas masks and PAPRs.
- Discuss the characteristics of filtering facepiece respirators.
  - Emphasize that not all filtering facepiece respirators are N95's.

Fit Testing and User Checks

Ask "What do you do to assure that your respirator fits?" and "How do you know when you have a 'good' fit?"

Ask "What are two types of respirator fit testing?"

An OSHA training video, "Respirator Fit Testing" (available at https://www.osha.gov/SLTC/respiratoryprotection/training_videos.html#video, total running time 11:59), may be useful here.

Review qualitative and quantitative fit-testing, including:

- Purpose for testing.
- Method of testing.
- Cautions when testing.

Review routine user checks including:

- Purpose for testing.
- Method of testing.
- When testing is necessary.

Discuss difficulties that may occur while using respirators.

Respiratory Protection Factors

Review how respirators are selected.

Discuss:

- Assigned protection factors.
- Fit factor calculation. (Review sample calculation in the Student Manual.)

Respiratory Protection Factor Exercise

Protection Factors: 1/2 face APR	=	10
full-face APR	=	50
SAR	=	1,000
SCBA	=	10,000

1. You are working where the industrial hygienist has been sampling a spill of chlorobenzene. The results indicate exposure to 1,500 ppm. The PEL for chlorobenzene is 75 ppm. What is the minimum type of respiratory protection that can safely be used?

PEL = 75 ppm

If using a half-face APR, Fit factor = $\frac{1500\ ppm}{10} = 150\ ppm$

If using a full-face APR, Fit factor = $\frac{1500\ ppm}{50} = 30\ ppm$

With a full-face APR, 30 ppm is less than the PEL, so this is the minimum acceptable type of respiratory protection.

2. You are working when a leak occurs which has a concentration of ammonia consisting of 3,500 ppm. The PEL for ammonia is 50 ppm. What is the minimum type of respiratory protection that can safely be used?

PEL = 50 ppm

If using a full-face APR, Fit factor = $\frac{3500\ ppm}{50} = 70\ ppm$

If using an SAR, Fit factor = $\frac{3500\ ppm}{1000} = 3.5\ ppm$

With an SAR, 3.5 ppm is less than the PEL, so this is the minimum acceptable type of respiratory protection.

Medical Fitness to Wear a Respirator

Ask "Why should a physician or other licensed health care professional review the job and examine you if you are assigned to wear a respirator?"

- List responses.

Discuss:

- Some of the possible physical conditions which may *prevent* an individual from wearing a respirator.
- Need for physical examinations prior to wearing a respirator. Include in the discussion who pays for the exam, how often exams are required, and who retains medical records for workers who wear respiratory protection.
- Some of the difficulties that may occur while wearing respirators.

An OSHA training video, “Medical Evaluations for Workers Who Use Respirators” (available at https://www.osha.gov/SLTC/respiratoryprotection/training_videos.html#video, total running time 9:39), may be useful here.

Facial Hair and Respiratory Protection

PAPRs do not require a tight seal to the face, and could be worn with facial hair, but they are not suitable for IDLH atmospheres.

Inspection, Maintenance, and Storage of Respirators

Discuss the significance of proper care of respiratory equipment. Refer to the Student manual to review requirements for cleaning, storage, inspection and maintenance of respirators.

An OSHA training video, “Maintenance and Care of Respirators” (available at https://www.osha.gov/SLTC/respiratoryprotection/training_videos.html#video, total running time 10:14), may be useful here.

Minimum Requirements for a Respirator Program

Ask "What criteria should be required for a respiratory protection program?"

- List responses.
- Refer to the list in the Student Manual for points to consider. Also refer to the Sample Respiratory protection program, available at http://www.osha.gov/dcsp/compliance_assistance/sampleprograms.html#Re

spiratory Protection. For contract programs, refer to the site's respiratory protection program.

The last 5 minutes of the OSHA training video, "Respiratory Protection in General Industry" (available at https://www.osha.gov/SLTC/respiratoryprotection/training_videos.html#video, total running time 10:22), discusses the written respiratory protection program, and would fit well in this section. Also, the OSHA training video, "Respiratory Protection Training Requirements" (available at https://www.osha.gov/SLTC/respiratoryprotection/training_videos.html#video, total running time 7:54), may be useful here.

Respiratory Protection Lab

Number of Instructors Required: 2

Time Requirement: approximately 3 hours

Materials

- NIOSH Pocket Guide and worksheets from student manual
- List of chemicals of interest to the participants

Procedure:

Introduction

The purpose of providing 3 hours of workshop is to give the trainees an opportunity to wear and become familiar with SCBAs, APRs and air-line egress units, and cleaning and inspection procedures. Also during this time, trainees practice proper fit-testing procedures, learn the difference between various models and sizes of full-face APRs, and learn to clean, assemble, and inspect a respirator for defective parts.

An OSHA training video, "Respirator Safety, Donning (Putting on) and Doffing (Taking off) and User Seal Checks" (available at https://www.osha.gov/SLTC/respiratoryprotection/training_videos.html#video, total running time 9:17), may be useful here.

The four stations include:

1. Donning and Doffing SCBA.
2. Fit-Testing APR.
3. Inspecting and Cleaning Respirators.
4. Wearing air-line with escape unit.

Each training center must have at least six functioning SCBAs if a full class of 24 participants is present.

Each of the four stations requires one lead instructor who has experience with or is very familiar with the equipment to be donned so that he/she can answer questions as needed. Each station has a checklist to guide the trainee and instructor as to what occurs at the station. After the trainee does the required tasks and completes the checklist, he/she brings the form to the station leader, who signs off, indicating that the trainee has completed the station.

It is Consortium policy that all "open-enrollment" trainees wear SCBA, egress unit, and APR. If enough equipment exists for only three rotations, then the Inspection and Cleaning Station can be modified to require trainees to wash the APR facepiece during the Fit-Testing Station and demonstrate respirator procedures and assembly in large-group presentation. If three stations are used (numbers 1, 3, and 4), then document the Station 2 checklist form with the APR Station Leader signing it and writing across the sheet "Wash APR at Station 1 and Inspection Demonstrated."

The checklists are part of the Consortium's documentation of training and must be collected from the trainees and maintained by the training institutions. Make copies of the checklist from your master instructor guide. Each trainee should receive copies of each checklist. Each station leader needs to read through the checklists to know the station's objectives

Station 1: Donning and Doffing an SCBA

Equipment

- One SCBA per trainee
- Extra facepieces in various sizes
- Minimum of 1200 lbs. of air pressure for each trainee
- Manufacturer's procedures for donning and doffing SCBA
- One table for every four trainees
- Paper towels and mild cleaning solution, or moist wipes.
- Performance checklist with clipboard and pen for each trainee

Organization:

- Depending on class size and equipment, determine how many groups to have.

- Set up an equipment pick-up area.
- Set up large tables (one for every 4 trainees) for donning and doffing.

Instructions:

- Issue facepiece and SCBA.
- Review and demonstrate the manufacturer's suggested procedures for donning and doffing SCBA. For example, if the manufacturer has a video, you may want to show it. Then demonstrate the procedures on one trainee.
- With your guidance, have trainees don SCBA, following the step-by-step instructions. The general steps follow:
    - Check air in SCBA to ensure that it is adequate for the duration of the lab (approximately 1200 Ibs).
    - Inspect SCBA to see whether all parts are functional.
    - Follow manufacturer's suggested "check-out" procedure, and don the SCBA.
    - Turn on the emergency valve.
    - Have trainees wear the SCBA.
- Give trainees the opportunity to walk up and down steps.
- Discuss hyperventilation; you should check to see that no one is hyperventilating and make eye contact to ensure that all are doing okay.
- Check emergency valve; reinforce that 5 minutes of air remain when the bell goes off.
- Have trainees doff SCBA, following step-by-step instructions:
    - Bleed air out of high-pressure hose, then remove from cylinder.
    - Remove and replace cylinder.
    - Check condition of the "O-ring."
    - Return to classroom with the facepiece, which will be used in other labs.
- Have trainees complete the Lab Performance Checklist, which you will review and sign.

Station 2: Fit-Testing an APR

Materials:

- One APR per trainee - assorted sizes and brands
- Cartridges to match APRs-various types and brands
- Qualitative fit-testing supplies:
    - Ventilation smoke tubes-stannic chloride (not recommended by NIOSH)
    - Aspirator bulbs
    - Isoamyl acetate or banana oil ampules
    - Saccharine kit (3M™ makes a kit with saccharine/bitter mister.)
- Anti-fogging solution
- Paper towels
- Cleaning solutions (MSA™ has a cleaner/sanitizer in packets.)
- 2 plastic wash basins
- Clipboard and pen for each team
- Performance checklist for each trainee

Organization:

- Depending on class size, determine how many groups to have.
- Set up an area with respirators, fit-testing chamber, and other supplies. Equipment should be displayed so trainees can handle it.

Instructions:

- Each trainee should select a respirator.
- Review and demonstrate maintenance and inspection procedures.
    - Check facepiece seal. Review degradation, and reinforce need for proper storage.
    - Remove cartridges, and check valves.
    - Check face shield.

    - Check headstraps and clips.

- Demonstrate and perform fit-testing.
- Review and demonstrate various types of fit-testing (routine or periodic).
    - Olfactory (smell)-isoamyl acetate or banana oil
    - Taste sensor-saccharine or bitter
- Show various types of cartridges.
- Don respirators.
    - Check to see that proper procedures are followed.
- Emphasize no facial hair; describe problems with contact lenses and dentures.
- Review requirement for optical kit in full-facepiece for workers requiring glasses.
- Fit-test each participant.
- Demonstrate cleaning and disinfecting techniques (optional).
    - Dips
    - Anti-fogging solutions
- Doffing
    - Demonstrate proper doffing technique.
    - Observe each trainee doff respirator.
    - Review maintenance procedures briefly.
    - Label respirators for trainee's exclusive use during the remainder of the program.
- Complete Lab Performance Checklist, which is reviewed and signed by the instructor.

Station 3: Inspecting and Cleaning Respirators

Materials:

Each station should have:

- Plastic wash basin.
- Soap and disinfectant.
- Sponges.
- Paper towels.
- Clipboard and pen.
- Lab Performance Checklist.

Organization:

Have station set up with equipment for cleaning respirators.

Instructions:

- Trainees should pair up and share wash basins, sponges, soap, and disinfectant (maximum 2 trainees per basin).
- Review and demonstrate inspecting and cleaning of respirators:
    - Disassemble respirator and all its parts.
    - Inspect respirators for worn parts and defects.
    - Wash and dry respirator.
    - Reassemble respirator.
- Provide information for SCBAs to allow completion of questions 6-8 on checklist. From the OSHA Technical Manual:
    - For all respirators, inspections must include a check of respirator function, tightness of connections, and the condition of the various parts including, but not limited to, the facepiece, head straps, valves, connecting tube, and cartridges, canisters, or filters. In addition, the elastomeric parts must be evaluated for pliability and signs of deterioration.
    - For SCBA's, which require monthly inspections, the air and oxygen cylinders must be maintained in a fully charged state and recharged when the pressure falls to 90% of the manufacturer's recommended pressure level. In addition, the regulator and warning devices must be inspected to ensure that they function properly.
- Have trainees complete Lab Performance Checklist, which you will sign and keep.

Station 4: Wearing an Air Line with Escape Unit

Materials:

- Four wash basins set up for cleaning respirators
- SAR (one per trainee)
- Minimum 1200 Ibs. air pressure for each trainee
- Egress units (one for each trainee)
- Clipboard and pen for each trainee
- Lab Performance Checklist

Organization:

- Have station set up with equipment for cleaning respirators.

Instructions:

- Review and demonstrate connecting to and disconnecting from egress unit using SAR.
- Have trainees practice connecting to and disconnecting from egress unit.
- Review, sign, and collect the trainees' completed Lab Performance Checklists: The checklists are retained by the training center as part of each trainee's permanent record.

Review Questions— Respirators - Answers

1. List several situations in which respiratory protection would be required.

   Oxygen deficiency, presence of chemicals, presence of dust, presence of fibers

2. What are the limitations of APRs?

   You can only wear an APR if the identity and concentration of contaminants are known, and it cannot be worn in an IDLH atmosphere.

3. What are the limitations of SCBAs?

   SCBA contains a limited supply of breathing air, is bulky and heavy, and must be used in positive-pressure mode if the atmosphere is IDLH.

4. Why are routine positive-and negative-pressure checks important?

   Positive-pressure checks are necessary to ensure the valves and other points have good seals. Negative-pressure checks are necessary to ensure the facepiece has a good seal with the face.

5. Why are medical exams required for persons who use respirators?

   You must have a medical exam prior to wearing respirators because they can aggravate conditions like lung disease, severe high blood pressure, and heart disease. People with claustrophobia may also find respirators highly uncomfortable.

6. List parts of a respirator that should be checked before and after each use.

   SCBA

   a. Condition of facepiece

   b. Hose and points where hose attaches to facepiece and tank

   c. Headbands to be sure they can be tightened for a good fit

   d. Head and tank harnesses for cracks, tears, or other defects

   e. Regulator according to manufacturer's directions

   f. Air tanks for damage

   APR

   a. Point where cartridges screw into mask and valves

   b. Condition of facepiece

   c. Headbands to be sure they can be tightened for a good fit

   d. Head and tank harnesses for cracks, tears, or other defects

7. Why is proper storage of respirators important?

   If improperly stored, respirators may become contaminated or damaged.

8. List items that must be included in a written respiratory protection plan.

   a. Procedures for selecting respirators for use in the workplace

   b. Medical evaluations

   c. Fit-testing

   d. Use of respirators in emergency situations

   e. How to clean, disinfect, repair, discard, and store respirators

   f. Procedures to ensure adequate air flow, quality and quantity

   g. Training of employees in respiratory hazards likely to occur

   h. Training of employees in proper use and limitations

   i. Procedures for evaluating program

CHEMICAL PROTECTIVE CLOTHING AND LEVELS OF PROTECTION

Time Requirement: Presentation – 1 hour

Number of Instructors: 1

Materials

- Chalkboard, marker board or easel with paper or whiteboard
- Markers
- Student Manuals
- OSHA standards on PPE
- NIOSH Pocket Guides
- Chemical protective clothing (CPC) illustration
- Storage rack or table for CPC

Chapter Objectives

When they have completed this chapter, participants will be better able to:

- Identify general types, uses and limitations of chemical-protective clothing.
- Identify the EPA/OSHA levels of personal protective equipment (PPE).
- Identify the general guidelines for selection of CPC and demonstrate selection for a scenario.
- Demonstrate the donning and doffing of CPC provided.
- Identify the procedures for inspection, maintenance, and storage of CPC.

Teaching Methods

- Presentation
- Demonstration
- Small-group activity

Suggested Instructor Preparation

- Read the Personal Protective Equipment chapter in the Student Manual.
- Learn what CPC is available to participants.
- Prepare lesson plan.
- Review exercise.

Minimum Content Requirements

The following are minimum content requirements for the PPE-Chemical Protective Clothing section:

- The different types of chemical protective clothing (CPC) that are available
- Recognize when CPC should be used and what type
- Different levels of protection of PPE
- Strengths and limitations of PPE
- Precautions when wearing CPC
- Penetration, degradation and permeation

- Use, care and maintenance of CPC
- Donning and doffing of PPE

Questions You May Be Asked

- We don't have any of this type of equipment where I work, what should I do?

Instructors should be prepared to facilitate discussion of strategies to upgrade PPE at the plant for contract programs. This issue should be resolved with management before the program begins. Instructors should reinforce that employers must provide adequate PPE. The consequences of refusal to work should also be raised.

Presentation of the Session

This session can be presented as follows:

Regulations Requiring Personal Protective Equipment

- Ask "Why is protective clothing necessary?"
- Ask "What are the types of protective clothing you have used in the past?"
- Discuss OSHA standards on PPE.
- Ask "What are situations in which protective clothing is required?"
    - List responses where the entire class can see them.
- Ask "What considerations should be made when selecting protective clothing?"
    - List responses where the entire class can see them.
- Refer back to the list of chemicals from the beginning of class, to relate them to the need for CPC.

Chemical-Protective Clothing

- Emphasize that different types of CPC are needed to protect against different hazards.
- Stress that totally encapsulating chemical-protective suits are the only ones that can protect from vapor hazards.
- Also note that CPC can have an expiration date, because it can and does degrade during use and storage.

Levels of PPE

- Ask "What equipment, according to OSHA, makes up Level A protective clothing?" and "What is required, and what is optional equipment?"
- If available, have a second instructor demonstrate the equipment that makes up Level A.
- Ask "When is Level A equipment necessary?"
- Repeat these questions and demonstration for Levels B, C, and D protection.
    - Non-vapor-tight TECPs may be used for Level B protection.
- List five precautions to consider when selecting CPC.
    - Have trainees make a list of five precautions to consider. This task should take about 3 minutes. Ask for volunteers to state what they considered.
    - List trainee responses where everyone in the class can see them. Add additional responses to complete the list.

Precautions When Wearing CPC

- Refer trainees to the Student Manual for a list of precautions in the use of CPC.
- Discuss issues when wearing PPE such as:
    - Hearing impairment.
    - Vision impairment.
    - Heat stress
    - Slips, trips, and falls.
    - Care taken when donning and doffing gloves to avoid rips and tears.
    - Avoiding placing hands and knees on the ground to prevent permeation of chemicals and abrasion of suit material.

Penetration, Degradation, and Permeation

- Discuss the following terms:
    - Penetration.
    - Degradation.
    - Permeation.

- Refer to the Student Manual for a list of CPC materials and their advantages and disadvantages.

Things to Remember When Using Chemical-Protective Clothing

Points to emphasize:

It does not have to be a hot day for heat stress to occur when wearing CPC.

- Proper inspection, cleaning, storage, and maintenance are essential.

Inspection, Maintenance, and Storage of CPC

- Ask "Why is it important to inspect, maintain, and properly store CPC?"
- Demonstrate how to inspect CPC including examining suits for cuts, holes, rips and tears, abrasions, weakness in zippers, signs of malfunctioning, and discolorations and visible chemical contaminants.

Exercise-Levels of PPE

1. At a paved storage area on the plant grounds, a truck has overturned, spilling unknown materials onto the ground. The material is vaporizing. You do not have any monitoring equipment. What level of protection should you wear?

   An unknown atmosphere requires Level A protection. If the contaminant and concentration are identified by responders trained to use monitoring equipment, the level may be lowered.

2. A tank containing ammonia has a minor leak. The ammonia level is measured about 247 ppm (300 ppm is IDLH for ammonia). What level of PPE should the person taking the measurement have used?

   Since the substance and potential health effects are known now that the sampling has been conducted the appropriate protection is Level B. Level A may be considered for skin irritant protection, and may have been needed when the sampling was conducted.

   Be prepared to discuss the relation between 247 and 300 ppm. If a method was used that is not very accurate (e.g., length of stain tubes) or a unit not calibrated in some time, then more protection may be warranted. Also, IDLH limits the exposure time.

3. A cylinder of chlorine has ruptured. Level A is required for the HaMat Technicians who have gone in to patch the leak. You will be assisting in the perimeter of the hot zone where the concentration is less than 1 ppm. What level of protection should you be wearing?

Level C with a minimum of a full-face respirator with an acid gas cartridge. Chlorine has a TLV TWA of 0.5 ppm and a ceiling of 1 ppm and is a severe irritant. The maximum use of a cartridge is 10 ppm. Continuous monitoring should be done and an SCBA donned if the concentration exceeds 1 ppm.

4. Leaking drums are reported in a storage room. Sensors in the room show that the oxygen concentration is 18% and combustible-gas is at 45% LEL. What should you wear to enter the room?

   Do not enter the room. A 45% LEL is a potentially explosive atmosphere. Point out that the measurements were obtained from a stationary sensor; it would have been a dangerous entry.

5. A storage tank containing phenol is apparently leaking, and a pool has formed on the ground. You need to enter the area to assist with monitoring. What level of PPE should you wear?

   Level A is needed since the concentration of phenol is unknown and the possibility for skin contact exists.

6. Several five-gallon containers of hydrochloric acid have been found leaking in the warehouse. Detector tubes (length of stain) indicate a concentration of 35 ppm in the warehouse. What level of PPE should you wear to confine the spill?

   Level C with an acid splash suit and a full-face respirator with acid cartridge. The maximum concentration for an acid gas cartridge is 50 ppm.

   Length of stain tubes are not very accurate, so consult the incident commander regarding whether Level C is sufficient. Continuous monitoring should be done and an SCBA donned if the concentration increases.

Review Questions-Personal Protective Equipment - Answers

1. What are some general types of CPC?

   General types are Totally Encapsulating Chemical Protective (TECP) suits and Partially Encapsulating Chemical Protective (PECP) suits.

2. List three situations at your facility that require PPE for emergency response. What level of protection (A, B, C) is required for each?

   Answers will depend on the facility and situation.

3. List some precautions to take while wearing CPC.

   All joints should be secured with tape, making a tab for easy removal; When removing suit, prevent contamination of internal clothing; Rapid heat and moisture build-up will occur in the suit during use; Look for signs of heat stress; Motion is restricted; Seams are the weak point; A variety of suit sizes should be available; Suits offer no fire protection; Do not exceed temperature limits of suits

4. When should PPE be inspected?

   PPE should be inspected when received from the distributor, issued to the user, put into storage, taken out of storage, used for training, used for emergency response, sent for maintenance, and received from maintenance.

5. When should PPE be replaced?

   Replace when TECP suits fail pressure test or when any PPE is torn or damaged.

DEC0NTAMINATION

Time Requirement:	Presentation – 1 ¼ hours Demonstration and Workshops – 1.5 hours
Number of Instructors:	2 or more--assure instructor:student ratio during exercises

Materials

- Chalkboard, marker board or easel with paper or white board
- Markers
- Table
- Student Manuals
- NIOSH Pocket Guides
- Open-space room which will allow groups mobility with protective equipment
- Four tables set up as lab stations
- Chemical protective clothing (CPC)
- Duct tape (Tape recommended by the manufacturer should be used in the field.)
- SCBA units (one per trainee)
- Bottles of breathing air (1 breathing air cylinder per trainee)
- Supplied-air respirator
- Air-purifying respirators
- Fit test hood and materials

- Cleaning wipes
- Minimum Decon Line Equipment:
    - (3) Play pools or large tubs
    - Plastic sheeting, 15' x 45' minimum, 4 mil thick or greater
    - Assorted brushes, minimum of 3 long-handled
    - (3) Garden hoses with water hook-up and backflow preventer or 3 garden sprayers
    - (4) Stools or three-step ladders (If using Level A, provide enough for suiting up, doffing, and decon.)
    - (3) Trash bins with liners
    - Clipboard and pen (one per trainee)
    - Lab Performance Checklists (one set per trainee)
    - Clothing racks
    - Plastic wash basins (1 per every 2 trainees)
    - Soap and disinfectant
    - Sponges
    - Paper towels

Chapter Objectives

When they have completed this chapter, participants will be better able to:

- Identify steps in pre-planning decontamination.
- Identify methods to prevent contamination of personnel, PPE, equipment and the environment.
- Identify the purpose of each of the work zones put in place during a hazardous materials emergency response.
- Identify basic decontamination methods.
- Demonstrate setting up a decontamination line, using supplies provided.

Teaching Methods

- Presentation

- Demonstration
- Small-group activity

Suggested Instructor Preparation

- Read the Decontamination chapter in the Student Manual.
- Assure all medical clearances have been obtained.
- Prepare lesson plan.
- Review exercises and activities; assemble performance checklists.
- Practice the lab.
- Review manufacturer's information and instructions for equipment used during module.
- Assemble supplies and equipment for lab stations.
- For contract programs, review relevant sections of the facility ERP.

Minimum Content Requirements

The following are minimum content objectives for the Decontamination module:

- Definition and purpose of decontamination
- Examples of standard operating procedures for preventing contamination
- Work zones - what are they and how are they distinguished?
- Decontamination methods: physical and chemical removal
- Protection of Decon Line Workers; decon of equipment, respirators and PPE; and disposal of contaminated materials.
- Hands-on PPE/Decon Lab - Level A, Level B or Level C (Level A or B required for open enrollment programs and strongly recommended for contract programs.)

Questions you may be asked

- Students might remark. “We don’t do it this way in our plant. So what are we supposed to do?” Instructors should be prepared to facilitate a discussion about working though union or management representatives to facilitate changes in the facility ERP. Emphasize that HAZWOPER requires the development and implementation of written decon procedures.
- Students may also ask if they are dragging contaminants around the plant and into their car and home if they do not follow decon properly. Instructors should use this opportunity to reinforce the need for proper decon to protect coworkers, family members and the community.

Presentation of the Session

This session can be presented as follows:

Introduction

Emphasize that most contaminants cannot be seen with the naked eye. Even if PPE, tools, etc. look clean, they must be decontaminated.

Pre-Planning for Decontamination

The ERP needs to be kept up to date for the hazards currently present in the facility.

Preventing Contamination

PPE is not foolproof. For best protection of your health, always avoid direct contact with contaminants as far as possible.

Work Zones

- The Hot Zone is also called the Exclusion Zone.
- The Warm Zone may be called the Contamination Reduction Zone (CRZ).
- The Cold Zone can be called the Support Zone.

Decontamination Procedures

Emphasize that different decontamination procedures are needed for different contaminants.

Decontamination Line

PPE should always be removed as if it is still contaminated.

It is not possible to successfully decontaminate porous materials such as wood.

Decontamination workers usually wear one level lower PPE than those they are decontaminating, unless the contaminant is exceptionally dangerous.

Suit-up and Decontamination Lab

Organization of the Lab

Two options:

Option A: Divide the class into 3 teams, depending on class size

Option B: If the class is very large, it is possible to have 4 teams

Be sure that each person has a buddy

Set up area with PPE. Equipment should be displayed so trainees have the opportunity to handle it.

Set up three stations

Donning PPE (15-25 minutes)

Decon and Doff PPE (15-25 minutes)

Set-up and assist with Decon (30-50 minutes)

Rotate teams through the three stations

OPTION A: 3 TEAMS

Phase 1:

Team 1 sets-up and performs decon line

Team 2 dons and doffs PPE and goes through decon line

Team 3 assists Team 2 suit-up and observes decon line

Phase 2:

Team 1 dons and doffs PPE and goes through decon line

Team 2 assists Team 1 suit-up and observes decon line

Team 3 sets-up and performs decon line

Phase 3:

Team 1 assists Team 3 suit-up and observes decon line

Team 2 sets-up and performs decon line

Team 3 dons and doffs PPE and goes through decon line

OPTION B: 4 TEAMS

Phase 1:

Team 1 (up to 8 trainees) begins suit-up

Team 2 (up to 4-6 trainees) assists with suit-up

Teams 3 and 4 (up to 4-6 trainees each) sets up decon line

Phase 2:

Team 1 passes through decon line

Team 2 begins suit-up

Team 3 assists with suit-up

Team 4 performs decon line

Phase 3:

Team 1 performs decon line

Team 2 passes through decon line

Team 3 begins suit-up

Team 4 assists with suit-up

Phase 4:

Team 1 assists with suit-up

Team 2 performs decon line

Team 3 passes through decon line

Team 4 begins suit up

Phase 5:

Team 1 performs decon line

Team 2 observes

Team 3 assists with suit-up

Team 4 passes through decon line

Instructions for the Lab

Donning the Equipment

Demonstrate each piece of PPE

Review CPC inspection procedures, emphasize degradation and permeation concepts

With one person, demonstrate proper donning procedures.

LEVEL A

Put on SCBA, follow manufacturer's check-out list (not on air)

Step into suit up to waist

Put on boots

Pull suit on the rest of the way

Allow trainees to sit in suits for 2-3 minutes

Instructor hooks trainee up to air, when student indicates ok

Instructor tests emergency valve

Instructor zips suit

Establish eye contact and check to see if trainee is ok

Repeat for each trainee

Have each display hand signals:

- “All right” (thumbs up)
- “Not all right” (thumbs down)
- “Get me out” (arms at throat)

Have each participant remove right arm from sleeve to activate emergency bypass valve

Have each participant signal ok and place their arm back in the sleeve

Proceed single file through decon line

LEVEL B or C

Put on suit

Tape sleeves and pant legs

Put on SCBA or SPR

Tape on hood

Proceed single file through decon line

Decon and Doff PPE

Trainees go through decon line and doff PPE

Check to see that trainees follow safety precautions

Trainees complete performance checklists which are reviewed and initialed by the Instructor

Set-up Decon Line and Assist with Decon

Option A

NOTE: The decon line is set up and disassembled by each team.

Trainees set up decon line

Instructors critique the line and correct problems as necessary

Trainees run decon line (may have them wear splash suits to keep from getting wet)

Trainees complete performance checklists which are reviewed and initialed by the instructor

Decon line is disassembled

Option B

NOTE: The decon line is set up initially and remains intact throughout entire exercise

First group (Teams 3 and 4) set up the decon line

Instructors critique the line and correct problems as necessary

Trainees run decon line (may have them wear splash suits to keep from getting wet)

Trainees complete performance checklists which are reviewed and initialed by the instructor

Final group (Team 1) disassembles the line

Review Questions—Decontamination - Answers

1. Why is it important to decontaminate personnel, PPE, and other equipment before re-entering the clean zone?

   Decontamination is important to prevent the spread of contamination from the Hot Zone, and to protect coworkers, family members and the public.

2. How can contamination be prevented?

   Contamination can be prevented by properly donning and doffing PPE, following SOPs, not walking through obviously contaminated areas, using remote-sampling techniques, covering monitoring and sampling equipment, wearing disposable garments, and containing the source of the hazardous material.

3. Describe the basic activities in each zone.

   Hot zone – plugging and patching, containing spills

   Warm zone – decontamination

   Cold zone – determine effectiveness of decontamination and do medical assessment

4. What are some basic decontamination methods?

   Physically or chemically removing contaminants

   Rinsing off contaminants

   Disinfecting

   Sterilizing

WORK PRACTICES

Time Requirement:	Presentation – 1 hour Demonstration and Workshops – 1 ½ hours
Number of Instructors:	1 (1:5 instructor:student ratio during exercises)

Materials

- Chalkboard, marker board or easel with paper or whiteboard
- Markers
- Table
- Student Manuals
- NIOSH Pocket Guides
- Open-space room which will allow groups mobility with protective equipment
- Four tables set up as lab stations
- Chemical protective clothing (CPC)
- Duct tape (Tape recommended by the manufacturer should be used in the field.)
- Assemble supplies on lab list.

Chapter Objectives

When they have completed this chapter, participants will be better able to:

- Identify general work practices required for confined space entry, lockout and fire protection.
- Identify information required for sizing up (hazards and risk assessment) the scene of a hazardous materials emergency.
- Identify work practices that may be performed at the Operations Level.
- Demonstrate one or more of the following techniques: absorbing, diking, diverting, blocking.

Teaching Methods

- Presentation
- Demonstration
- Small-group activity

Suggested Instructor Preparation

- Read the Work Practices chapter in the Student Manual. New material on the Hierarchy of Controls has been added.
- Review background reading materials.
- Prepare lesson plan.
- Review exercises and activities.
- Practice the lab.
- Review manufacturer's information and instructions for equipment used during module.
- Assemble supplies and equipment for lab stations.
- For contract programs, review relevant SOPs and the facility ERP.

Minimum Content Requirements

- SOPs and their importance to emergency response
- Control, containment, and confinement

- Hands-on Lab

Questions you may be asked

Trainees may state that particular SOPs are lacking at their work site despite relevant ongoing activities. The instructor must be ready to facilitate discussion of how to determine if an SOP exists, how to obtain a copy within the union/management structure and approaches to problem resolution.

Trainees who will only receive the operations-level training may ask what they should do if they are expected to perform response activities beyond their level of training. The instructor should be prepared to emphasize the training requirements of 1910.120 and facilitate a discussion of problem resolution within the union/management structure. For contract programs, the instructor should be familiar with the company ERP and if the situation exists where employees will perform duties beyond their level of training the instructor should have previously discussed the situation with management.

Presentation of the Session

This session can be presented as follows:

Standard Operating Procedures

Routine SOPs

SOPs vary from one facility to another.

Confined-Space Entry Procedures

SOPs should be reviewed for compliance with OSHA standard 1910.146, Permit-Required Confined Spaces.

Rescues from confined spaces are exceptionally dangerous. They should not be attempted without specialized training. Every year, many would-be rescuers die in confined spaces. Responders who may be required to rescue victims must be provided training in the types of spaces at the facility and perform a simulated rescue annually.

Lock-out Procedures

After lockout, it should always be attempted to start a machine, in order to make sure that it is actually locked out. Only the person who put the lock on may remove it. See OSHA standard 1910.147, the Control of Hazardous Energy (Lockout/Tagout).

Fire Prevention

Planning and practicing are essential for effective fire prevention. Fire extinguisher training should be conducted annually.

SOPs for Emergencies

You should be familiar with the ERP before an emergency occurs. As an operations-level first responder, you should respond in a “defensive fashion without actually trying to stop a release.” The purpose of the response is to protect nearby persons, property or the environment from the effects of the release.

Work Practice Lab

Instructions for Work Practice Lab and Small Group Activity

This lab is divided into three activities which occur concurrently. The class should be divided into three groups and rotate through each activity. Minimal PPE is recommended only to prevent trainees from becoming excessively wet. Full PPE with respirator/SCBA may be used, but will require more time and create a time imbalance between the small group activity and the hands-on labs. A minimum of three instructors is needed to successfully present these activities.

If the class is very small, the two labs may be held concurrently and the small group activity is omitted.

NOTE: These activities may be modified for contract programs to adjust for more “real-life” settings which may be encountered in the facility. In no instance should modifications be made which are beyond the scope of the operations level first responder.

Small Group Activity

Supplies

Small Group Activity worksheets

Pens

Organization

Instructor should be available for questions but should not provide “clues”

The instructor should facilitate a discussion at the end of the exercise.

Answers

1. What information would you want to gather?

Assess the extent of the spill from a distance

Determine if others are present in the vicinity

Observe if a placard is on the truck

2. What should you do at this point?

- *Notify a supervisor, who will activate the emergency response system.*

Now you are a member of the response team. The chemical has been identified as **acetone**—a chemical that is routinely received at the plant.

3. What should you know about the chemical?

- *You should look up the safety, health and fire hazards of acetone.*

4. What previous training should you have had?

- *Hazard Communication*
- *Respiratory Protection*
- *Emergency Response*

Diking and Absorbing Lab

PPE

Splash suits

Gloves

Impervious boots

Face shield, depending on spill scenario

Equipment and Supplies

Spill liquid (non-toxic)

Absorbent materials (absorbent socks, clay chips, dirt/sand, cat litter, etc.)

Non-spark tools (shovel, scoop, pushbroom, etc.)

Waste drums

Performance checklist with clipboard and pens for each trainee

Organization

Assemble equipment and PPE

Prepare simulated spill (leaking drum, pipe, container, etc.)

Instructions

Teams should assemble the necessary equipment from available supply and develop a strategy.

Team reviews strategy with instructor

Instructor and team members don PPE

Team approaches spill then dikes and absorbs spill in a manner which minimizes contact with the material.

Instructor critiques diking/absorbing.

Team discusses disposal of PPE/equipment.

Instructor reinforces concepts of decontamination and the fact that operations-level workers may not directly come into contact with spill or clean it up.

Team members complete performance checklists which are reviewed and initialed by the instructor.

Block the Drain Lab

PPE

Splash suits

Gloves

Impervious boots

Face shield, depending on spill scenario

Equipment and Supplies

Spill liquid (non-toxic)

Blocking materials (carpet, plastic sheeting, garbage can cover, etc.)

Non-spark tools (shovel, scoop, push broom etc.)

Waste drums

Dirt or other weights

Performance checklist with clipboard and pen for each trainee

Organization

Assemble equipment and PPE

Prepare simulated spill (leaking drum, pipe, container etc.) with access to drain (self-contained drain).

Instructions

Teams should assemble the necessary equipment from available supply and develop a strategy

Team reviews strategy with instructor

Instructor and team members don PPE

Team approaches spill then places blocking material over the drain until it is completely covered. The activity should be performed in a manner which minimizes contact with the material. Diking may also be done, as necessary.

Instructor critiques blocking and diking (if applicable) activities.

Team discusses disposal of PPE and equipment.

Instructor reinforces concepts of decontamination and need for identification of material.

Team members complete performance checklists which are reviewed and initialed by the instructor.

Review Questions—Work Practices

1. Why are SOPs necessary for emergency response?

   SOPs are needed to provide guidelines for carrying out tasks safely.

2. Explain the importance of the buddy system.

   The buddy system provides workers with someone to help them in case of an emergency. Also, if one worker forgets a safety precaution, his/her buddy can remind him/her.

3. Describe a confined-space situation. Why is a permit necessary?

   A confined-space situation has limited ways to get in and out, is not intended for continuous human occupancy, yet it is still possible for a person to enter and work. A permit is necessary because confined spaces pose many hazards.

4. What are the basics of a lock-out procedure?

   The lock-out procedure is basically when a piece of equipment is locked so that no one else can turn it on or use it. A tag is placed on the equipment to warn others. This helps prevent people from being injured.

5. List several elements of a fire-prevention program.

   Fire prevention programs should include maintaining fire-extinguishing media, properly positioned fire-extinguishing equipment, having adequately trained fire brigades, routine drills, etc.

6. What is the primary SOP for an emergency response?

   The ERP

7. What “immediate effects” occur at a release or spill?

   Immediate effects are air discoloration, unusual smells, chemical burns or discoloration on floor/gravel, and worker reactions (coughing, etc.).

8. Preliminary identification includes the use of which resources?

   Preliminary identification uses placards or labels, shipping papers, SDSs, physical characteristics and monitoring results to figure out the chemical(s) present.

9. What are the duties of the operations-level first responder, according to 1910.120 or the ERP at the plant?

   The operations-level first responder may take actions such as diking, diverting, blocking, absorption and collection.

10. List an example of basic control.

    Containment.- plugging a hole in a leaking drum

    Confinement – blocking a ditch or storm drain

11. Why is a critique of an incident required?

    Incident critiques are required to address any concerns that came up during the incident regarding equipment, training, etc. Critiques also help to improve existing plans.

12. What actions can be taken to ensure that the equipment and supplies are ready in case of an emergency?

    To keep equipment and supplies ready for emergencies, store them properly and perform regular inspections. Always restock following training or emergency response.

EMERGENCY RESPONSE PLAN

Time Requirement: Presentation – 1.5 hours

Number of Instructors: 1

Materials

- Chalkboard, marker board or easel with paper or whiteboard
- Markers
- Table
- Student Manuals

Chapter Objectives

When they have completed this chapter, participants will be better able to:

- Identify the topics that must be covered in the Emergency Response Plan (ERP).
- Identify the roles of key positions in the Incident Command System (ICS).
- Identify activities in the ERP activities that occur in each zone during a response.

Teaching Methods

- Presentation
- Demonstration
- Small-group activity

Suggested Instructor Preparation

- Read the Emergency Response chapter in the Student Manual.
- Obtain company ERP or use MWC 'For training only ERP'.
- Prepare lesson plan.
- Review exercise.

Minimum Content Requirements

The following are minimum content requirements for the Emergency Response Plan chapter:

- Elements of an ERP
- When an ERP is required
- The ICS and team member duties
- Zones in which various roles are conducted
- ERP exercise

Questions you may be asked

- Trainees may point out that no ERP is available at their facility. This impression may be a result of incomplete training by the employer or be an apparent violation of 1910.120. The trainer must be ready to facilitate the discussion to determine if a plan does exist and how to obtain a copy for information and/or review. For contract programs, plant personnel responsible for the ERP should be identified. For general admission programs, it may be up to the employee to investigate further.
- In the case of contract programs where the employer's ERP is known to be inadequate, the instructor should be comfortable directing a discussion of approaches to problem resolution.

- Trainees may recognize that previous work may have resulted in exposure to hazardous materials because of inappropriate PPE or assignments in zones for which the workers were not properly protected. These individuals should be referred to the union representative or occupational physician.

Presentation of the Session

This session can be presented as follows:

Emergency Response Plan (ERP) Requirements

An ERP should be in place at any plant where employees are participating in emergency response.

Where employees do not participate in emergency response, an Emergency Action Plan (EAP) is necessary. Employers at these facilities must evacuate their employees and not allow them to assist in case of any emergency.

The Incident Command System (ICS)

The Incident Command System was developed to improve coordination and communication between different emergency response agencies following a devastating 1970 wildfire in California. It can be adapted to a large or small emergency.

Communication

Plain language is used with the ICS for the purpose of improved communication. Codes used by one organization may not be the same as those used by another.

Zones and Their Primary Activities

The cold zone should always be located upwind from the emergency.

Emphasize that operations-level emergency responders may work in the Hot Zone in a defensive fashion only. Only persons trained at the technician's level will approach the point of release.

Emergency Response Exercise - Answers

Pre-Emergency Planning

1. What is the importance of pre-emergency planning?

   To be ready if an emergency occurs

Phone numbers available

Equipment/supplies properly maintained and stored

Personnel trained

2. What pre-emergency planning is included in the plan?

Coordination with LEPC, police, fire and hospital

Annual meetings

Development of ERP

Distribution of ERP

Review procedure for ERP

3. What other pre-planning items might be included to improve the plan?

Monthly meetings with safety personnel

Involvement of employees in hazard identification

Lines of Authority

4. What is the chain-of-command in this command in this ERP?

Emergency coordinator (= Incident Commander)

Technician

Operations

5. Who are the members of the ER team?

Coordinator and alternates

Technicians

Operations

Head Guard

6. What are the duties of the Incident Commander?

Identify material involved in an emergency

Activate internal facility alarms

Notify outside organizations

Assume overall authority

7. What are the duties of the Operations-Level First Responder?

Use provided PPE

Basic control, containment and/or confinement

Implement basic decon

Participate in other procedures as directed and trained.

Communication

8. What are the purposes of communication during an emergency?

To facilitate response

To facilitate treatment of any injuries

9. What can happen to interfere with communications?

Radios may jam

Without backup system, audible alarms may be inactivated by power failure

Smoke may obscure hand signals

Excess noise may interfere with voice communication

Phone lines may be down

Communication may be impeded if lights are not operable

Training

10. What training is required for personnel?

1910.120

1910.1200

1910.134

Degreaser maintenance (see Section 5)

Fire prevention (see Section 5)

11. Are the training requirements consistent with 29 CFR 1910.120?

Yes

12. Why is training important?

Reduce response time

Reduce injuries

Prevent spread of contamination

Emergency Recognition and Prevention

13. What are the procedures for fire alarms?

Evacuate (non-supervisory)

Shutdown operation and evacuate (supervisory)

Notify front gate guard

14. What is required for fire prevention?

Degreaser maintenance

Fire suppression system maintenance and testing

No smoking policy

Training on no smoking, fire alarm system

15. What types of chemical accidents are possible? What are the procedures to notify personnel?

Release of TCE

Entry into degreaser

Action: report to supervisor

16. What are the evacuation procedures? Who can authorize an evacuation?

Go to flag pole. Do not return until told to or the "all clear" sounds

Not stated who can authorize

Decontamination

17. What are the decon procedures?

Water and detergent wash

Extinguisher sent out for refilling

Respiratory protective equipment cleaned with isopropyl alcohol

Clothing sealed and disposed of

1. Are the decontamination procedures adequate? If not, what additional information is needed?

No. How are decon equipment/supplies cleaned?

If sludge from the degreaser gets on respirators, will isopropyl alcohol remove it?

Emergency Medical Treatment

19. Who will provide First Aid?

First shift nurse

Designated person on second and third shifts

20. Are the emergency medical treatment procedures adequate? If not, what additional information is needed?

Probably.

The issues: distance to treatment

Reasonably anticipated "worst-case" scenario

Training of persons at the site

Emergency Equipment

21. What emergency equipment is available?

Safety showers

Eye wash

SCBA

Spill control cart

Respirators

Gloves

Safety glasses

First-aid supplies

Fire hoses/extinguishers

22. What procedures are in place to maintain and inspect this equipment?

Cannot be reviewed. In an appendix (trust us!)

Emergency Response

23. What are the procedures for clean-up of small spills?

Absorb, drum

Use SCBA

Collect runoff

Dispose of clothing

24. What are the procedures for clean-up of large spills?

Call outside group

25. Are the procedures for spill clean-up adequate? If not, what additional is needed?

No. How are decon equipment/supplies cleaned?

If sludge from the degreaser gets on respirators, will isopropyl alcohol remove it?

Review Questions-Emergency Response Plan - Answers

1. What are some required parts of the ERP?

    a. Pre-emergency planning and coordination

    b. Personnel roles, chain of command, 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.

    g. Decontamination procedures.

    h. Emergency medical treatment and First Aid procedures.

    i. Emergency alerting and response procedures.

    j. Critique of response and follow-up.

    k. Emergency response equipment.

    l. Emergency response.

2. Why is preplanning necessary?

    Preplanning is necessary so everyone can be ready for an emergency.

3. What SOPs might be included in the ERP?

    a. Respirator and PPE

    b. Communication

    c. Fire suppression system

    d. Maintenance and testing

    e. Confined space entry

4. Describe the function of the ICS, and list personnel and duties that may be part of it.

    a. Incident Commander - directs all aspects of the team

    b. Safety Officer - monitors and implements the safety plan

    c. Liaison Officer - coordinates between agencies

    d. Public Information Officer - controls releases to the media

    e. Operations Officer - oversees operations for sampling, decon, security

    f. Planning Officer - prepares research brief on the material present, PPE and hazards involved

    g. Logistics Officer - provides equipment as well as food and water for long duration incidents

    h. Finance Officer - purchases needed materials and evaluates use of funds

SIMULATIONS

Time Requirement: Table top exercise and hands-on activities – 3 hours

Number of Instructors: 2 or more to maintain required ration

Materials

- Chalkboard, marker board or easel with paper or whiteboard
- Markers
- Table
- Student Manuals
- SDS for acetone from student manual (or another chemical)
- For contract programs, company ERP; for open enrollment MWC ‘For training only ERP’
- NIOSH Pocket Guides
- DOT Guidebooks
- Open-space room which will allow groups mobility
- Spill Cart supplies (see Student Manual)

Chapter Objectives

When they have completed this chapter, participants will be better able to:

- Use resource materials to determine physical, chemical, and health hazards.
- Select appropriate PPE from that available on a spill cart.
- Secure an incident area.
- Plan a response.
- Terminate the response and plan post-response steps.

Teaching Methods

- Small-group activity
- Hands-on lab

Suggested Instructor Preparation

- Read the Simulations chapter in the Student Manual.
- Prepare lesson plan.
- Review exercises and activities.
- Practice the lab.
- Review manufacturer's information and instructions for equipment used during module.
- Assemble supplies and equipment for hands-on simulation.
- Prepare handouts.
- For contract programs, review relevant SOPs and the facility ERP.

Minimum Content Requirements

- Table top exercise
- Critique of response plans
- Hands-on activities (Level A or B required for open enrollment programs and strongly recommended for contract programs, with appropriate medical clearances)

- Critique of hands-on activities

Questions you may be asked

Trainers should be prepared to discuss variations on the incident.
Trainees will undoubtedly ask, What if...”. Thorough trainer preparation for the many possibilities is very important.

Presentation of the Session

This session can be presented as follows:

Overview of Simulations

The simulations help to reinforce concepts that have been learned in this course.

Spill Response Table-Top Exercise - Answers

Part-A ---Size-up and Chain of Command

1. Who is the emergency coordinator (Incident Commander)?

The plant manager

2. Where will you do the size-up? Place characters on the map.

Through Bay 3 door

3. What should you be looking for during the initial size-up?

Placard to indicate fire hazard
Truck-trailer type and position
Good location for a command post
Location of sewer drain
Hazard recognition of the oxygen tank and confined space of the trailer
Determination of personnel in the area

4. Is there a hazardous material present? How do you know?

Yes, acetone is a hazardous material. It is flammable and a health hazard, according to SDS, NIOSH pocket guide and ERG.

5. Where will you secure the scene? Sketch this area on the map.

Notify the guard at the guardhouse to close the gates to driveways.
The trucks in the shipping area should not be allowed to leave.

6. What type of protective clothing and respiratory protection do you need at this point? Select these items from the spill cart.

Level B. Pressure-demand SCBA with extra air cylinder
Natural rubber gloves,
PVC disposable gloves
PVC disposable boots
Not on the cart, but needed anyway: hooded chemical protective clothing, outer chemical-resistant boots with steel shank.

7. Where will you make the entry to the scene? Place characters on the map according to the entry procedures.

Make entry to the scene at Bay 1 for monitoring.

Part B-Monitoring I

The decision is made to send in two team members dressed in Level B to examine the spill area more closely and monitor. The entry team approaches the scene with a direct reading instrument.

6. What should the two-person team measure first—oxygen or flammables?

Oxygen should be measured first because their meter will not measure flammables in an oxygen-deficient atmosphere.

Part C—Monitoring II

The first reading above zero is obtained at the northwest corner of the entry to the bay. The readings are:

Oxygen: 20.4% **%LEL: 8.9%**

9. What should the two-person team do at this point?

   Continue to approach the spill and monitor.

Part D—Monitoring III

The team continues to approach the spill and obtains the following readings in the air just above the pool of spilled material.

Oxygen: 19.9% **%LEL: 15.0%**

The team also measures the air at the lower part of the open door.

Oxygen: 19.6% **%LEL: meter "pegs out," goes to zero**

10. What should the spill team do now?
    Leave the spill area and return to the support zone. The trailer is a confined space with an explosive atmosphere.

11. Are the two team members adequately protected?
    The team members are adequately protected from respiratory and skin hazards but not the hazard of explosion.

12. Where should the Hot Zone and the Warm Zone be placed? Mark the zones on the map.
    Hot zone surrounds the truck and Bay 1.
    Warm zone includes half of Bay 2 and all of Bay 3.
    Cold zone is northwest of Bay 3.

13. Is evacuation necessary? If "Yes," describe who should be evacuated and how far away.

    Yes, this is a potentially explosive spill. Evacuation of the whole plant should occur. Consult the ERG for distances.

14. How will you implement evacuation? Explain your answer.

    Procedures for evacuation are defined in the ERP.

15. Should the overhead door in Bay 3 be closed? Explain your answer.

    Bay 3 is upwind from the spill and should not be at risk. Acetone is heavier than air, so it should settle to the ground and not enter the building. Closing the door would create sparks. Having Bay 3 open allows it to be an observation post.

16. What should be done about the spill with the information you now have available?
    The flow into the sewer gate should be prevented. If the acetone gets into the system, there is potential for an even greater explosion or fire.

Part E-Deciding on the Appropriate Response

The product is near the sewer grate but has not spilled into the sewer system. The decision is made to stop the flow of material before it enters the sewer drain.

17. How will the product flow be confined?
    Use supplies from the spill cart.
    The spill should be diked uphill from the sewer grate.
    No entry to the trailer should be attempted – it is an IDLH situation.

18. How will the flow into the sewer system be prevented?
    Cover the sewer grate with plastic and special sealing mat and dike around the grate.

19. What other procedures may be used?
    A non-sparking (plastic) container should be placed under the drip from the trailer.
    No entry of the trailer should be attempted.

20. Should outside assistance be requested? Explain your answer.
    Yes, the fire department and hazmat team are needed to suppress the explosive vapors.
    A clean-up contractor will also be needed.

Part F—Using Off-Site Emergency Responders

A decision is made by the ABC Manufacturing Company plant manager to contact the fire department. The HazMat team and the engine company arrive.

21. Where should the ranking fire officer be met? Mark the area on the map.
    At the main gate.

22. What should the fire officer be told?
    Report on the current situation: the product, what's been done and scope of assistance required.
    Agree how the situation will be managed before entry is granted.
    Consult with the ERP for specific agreements between the company and the fire department.

23. What should the spill team do after the information is relayed?
    You should carry out the instructions of the Incident Commander.

24. Who is now the Incident Commander?
    The fire chief.
    This may vary among states. Be aware of state regulations and the specifics of the plant ERP.

Part G-Nearing Termination

The fire department uses foam to suppress vapors and begins airing out the trailer. A clean-up contractor, called by personnel at XYZ Chemical, arrives at the gate.

25. Who will relay information to the contractor?
    The Incident Commander will coordinate the discussions with the

spill team coordinator, truck driver, and the contractor.

26. What is the role of the spill team now?

Specified in the ERP; usually none, except spill team coordinator who should be available to the Incident Commander and the cleanup

contractor.

27. What is the role of the fire department at this time?

Stand by until the fire hazard is removed.

28. What is the role of the contractor at this time?

Clean up after the hazard is mitigated or complete the mitigation started by the fire department

Part H—Termination

The contractor completes the mitigation and clean-up while the fire department waits until no fire hazard exists. The spill team is told to leave the scene.

29. What will each spill team member do to document his or her actions?

Write up report as specified in the ERP.
Keep personal notes or make copies of report, where appropriate.
The XYZ Company must make an EPA report.
ABC Manufacturing may also be required to comply with state and local laws and regulations regarding incident reports.

30. What tasks should be done to complete the termination of the response?

Recharge equipment and restock supplies. Follow-up investigation and critique principals.

Critique 1: Table Top

Guidelines:

You will have approximately 20 minutes for the critique.

- Hear reports from each small group team on the table top exercise. Ask for a short report, detailing the site layout and how they would implement their response.
- When all groups have reported, distribute the answers to the tabletop exercise and spend approximately five minutes reviewing any questions or problems.

Spill Response Hands-On Exercise

Instructor Notes
Site: Select a site for the hands on exercise that approximates as closely as possible that which is described in the table-top exercise. A slight downhill slope with a sewer grating at the base is ideal, but you might have to use some props to accomplish this. Colored tape in the ground can also serve as a prop to add some realism to the exercise.

Materials: Assemble as many of the materials on the Spill Cart list from the table-top exercise as possible and the publications that will be needed by the Research Support Team. A stopwatch may be useful to time the components of the exercise.

Critique: Videotaping of the entire exercise is strongly recommended. Permitting the trainees to critique their own performance is more meaningful than extensive instructor critique. Become familiar with the briefing papers and review the guidelines for critiquing. Your comments need to be consistent with the written materials.

Organization:

- Depending upon group size, you may want to assign one whole group to a team for the table-top. Larger groups can be split up into observers and team members.
- Hand out briefing papers and make job assignments after the table-top critiques are complete.
- Observers should be issued the standard evaluation checklists. Ask each observer to fill out the checklists completely and be prepared to summarize their findings.
- Checklists can also be used for self-evaluation by all the team members after the hands-on tasks have been completed.
- One instructor must act as the Incident Commander. All groups should communicate with the Incident Commander. It is important for the instructor to be prepared and not ask them to perform tasks beyond the Operations level.
- Note: At the Operations level of training, none of the trainees are prepared to act as the Indent Commander.

Briefing Paper: Operations Leadership Team

Your first step is to elect a team leader. All other team members are the leader's assistants and are delegated by the leader to act on his/her behalf.

Responsibilities of the team are as follows:

- Coordinate with the Incident Commander.
- Coordinate activities with all teams (security, research, dike/confine, and decon).
- Establish a staging site and a chain of operations-level communication (and notify all affected parties) and maintain ongoing communications with all teams.
- In consultation with each team, arrange for personal protective and respiratory equipment and supplies, using only what is available from existing supplies.
- Participate in termination procedures for the response.
- Keep an accurate log of all response activities, and maintenance records.

Your Operations team may, after consultation with the Incident Commander, move anywhere on the site, but you must wear appropriate protective equipment if you enter the warm or hot zones.

Briefing Paper: Site Security Team

Your first step is to elect a team leader. The team leader carries out the site security detail, and must report periodically to the Incident Commander.

Responsibilities of the team are as follows:

- Use appropriate materials and labels to mark off perimeter and access points.
- Maintain security and keep unauthorized persons out of restricted areas.
- Assist with evacuation, and assist the Incident Commander when requested.

You are authorized to go anywhere on site, except into the restricted areas. You may enter restricted areas if authorized by the Incident Commander and wearing the appropriate levels of PPE and respiratory protection.

Briefing Paper: Research Support Team

Your first step is to elect a team leader. The team leader is in charge of your task, and must report periodically to the Incident Commander.

Responsibilities of the team are as follows:

- Prepare a research brief on the hazardous materials involved. Include: incompatibilities, flammability and explosion hazards, first aid requirements and other relevant information.
- Advise the Incident Commander on appropriate personal protective equipment and respiratory protection from the available supplies.
- Perform any other research when directed by the Operations Leader.

Briefing Paper: Dike and Confinement Team

Your first step is to elect a team leader. The team leader is in charge of your task, and must report periodically to the Incident Commander (this can be done by radio, if necessary).

Responsibilities of the team are as follows:

- In consultation with the Incident Commander, execute an emergency response which includes diking and confining the spill material utilizing the materials available.
- Suit up and enter the hot zone, carrying out the response, and when complete, proceed to the decon line for decontamination.
- Perform any other tasks in the hot or warm zone if and when directed by the Incident Commander.

Briefing Paper: Decontamination Team

Your first step is to elect a team leader. The team leader is in charge of your tasks, and must report periodically to the Incident Commander (this can be done by radio, if necessary).

Responsibilities of the team are as follows:

- In consultation with the Incident Commander, prepare and construct a decontamination line capable of effectively decontaminating the entry teams utilizing the materials available.
- Don the necessary protective equipment and respiratory protection, and when directed, performing the decontamination of the Dike and Confinement team members.
- Perform any other decon tasks if and when directed by the operations team leader.

Operations Leadership Team - Checklist

Completed/Observed
YES / NO

Assigned Roles

1. Elected a leader. _____
2. Coordinated all the operations level teams. _____
3. Established an operations level staging area. _____
4. Maintained ongoing communications. _____
5. Arranged for use of appropriate PPE. _____
6. Coordinated activities with the incident commander. _____
7. Participated in termination procedures. _____
8. Kept a log. _____

Other Actions Observed

Operations Level Activity
YES / NO

Notes

Site Security Team - Checklist

Completed/Observed
YES / NO

Assigned Roles

1. Elected a leader. _____
2. Marked off perimeter and access points. _____
3. Maintained security at all times. _____
4. Kept unauthorized persons out. _____
5. Assisted in evacuation, if necessary. _____
6. Assisted the team leader, as requested. _____
7. Leader only: Assisted the Incident Commander as requested. _____

Other Actions Observed

Operations Level Activity
YES / NO

_____

_____

Notes

_____

_____

_____

Research Support Team - Checklist

Completed/Observed
YES / NO

Assigned Roles

1. Elected a leader. _____
2. Prepared information on the hazards, i.e., Incompatibilities, flammability, explosion hazards, first aid requirements, or similar. _____
3. Advised the team leader on PPE. _____
4. Performed other duties as requested. _____
5. Leader only: Assisted evacuation, if necessary. _____

Other Actions Observed

Operations Level Activity
YES / NO

Notes

Dike and Confinement Team - Checklist

Completed/Observed
YES / NO

Assigned Roles

1. Elected a leader. _____
2. Selected the appropriate materials from the available supplies _____
3. Properly donned PPE. _____
4. Entered the Hot Zone carefully to avoid contamination_____
5. Minimized the possibility of contamination while in the Hot Zone. _____
6. Diked the spill. _____
7. Covered the drain. _____
8. Minimized the possibility of contamination while leaving the Hot Zone. _____

Other Actions Observed

Operations Level Activity
YES / NO

Notes

Decontamination Team - Checklist

Completed/Observed
YES / NO

Assigned Roles

1. Elected a leader. _____
2. Constructed decon line from available materials. _____
3. Properly donned PPE. _____
4. Conducted decon minimizing possible contamination. _____
5. Decontaminated fellow team members. _____
6. Performed decon termination procedures. _____

Other Actions Observed | Operations Level Activity YES / NO

_____

_____

Notes

_____

_____

_____

Critique 2 - Hands-On

Guidelines:

- Ask for comments from the evaluators on the hands-on exercise. When this segment is completed, ask the evaluators to submit their checklists.
- Depending on the amount of time remaining, open up the discussion to comments from participants regarding their reactions to the hands-on exercise. Instructors should also be afforded an opportunity to participate.
- The entire exercise is a learning experience. Videotape playback can help trainees to recognize their own successes and problem areas.

Use a blackboard or an easel with paper to record insightful or key points.

CLOSING AND PROGRAM EVALUATION

This concludes the program and includes the posttest.

Time Requirement: 1 hour

Number of Instructors: 1

Materials

The following materials will be needed:

- Chalkboard, marker board or easel with paper or whiteboard
- Markers
- Posttest
- Evaluation forms

Objectives

- Review of chemicals and summarize the discussion.
- Answer questions.
- Review need for additional training for technician level activities and the need for annual refresher.
- Thank participants. Identify key rights and responsibilities workers have under the

OSHAct.

Teaching Methods

- Discussion

Suggested Instructor Preparation

- Review questions raised during the program by participants.

Minimum Content Requirements

The following are minimum content requirements for the section:

- Review initial questions.
- Answer last questions
- Thank participants.

Questions You May Be Asked

1. "What happens if I do not take a refresher?" If needed for a job, you will not be eligible. Some employers 'stretch' the requirement to 18 months, if the refresher is taken ASAP, but it is a gamble.

2. "What if there is no more training, but I have to plug/patch?". Generally we find that employers provide the additional training, but if not, share the requirements with your supervisor. See the OSHA website for information regarding filing a complaint.

Presentation of the Session

Thank participants for attending the program.

This is an opportunity for final questions and to assure that the list of questions generated on day has been addressed during the program.

Evaluation is important to continued program improvement. This should not be rushed. Provide 10 minutes to complete the program evaluation forms and collect them prior to the postttest.

Grade posttest, per center protocol. Distribute 'successful completion' certificates to those who have met the criteria, or tell participants when/how the results will be provided.