# Initial Response to Hazardous Materials Incidents: Basic Concepts

IRHMI:BC-Student Manual

*2nd Edition, 1st Printing-July 2003*

Homeland Security

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**U.S. DEPARTMENT OF HOMELAND SECURITY**

**PREPAREDNESS DIRECTORATE**

**UNITED STATES FIRE ADMINISTRATION**

**NATIONAL FIRE ACADEMY**

## FOREWORD

The U.S. Fire Administration (USFA), an important component of the Department of Homeland Security (DHS) Preparedness Directorate, serves the leadership of this Nation as the DHS's fire protection and emergency response expert. The USFA is located at the National Emergency Training Center (NETC) in Emmitsburg, Maryland, and includes the National Fire Academy (NFA), National Fire Data Center (NFDC), National Fire Programs (NFP), and the National Preparedness Network (PREPnet). The USFA also provides oversight and management of the Noble Training Center in Anniston, Alabama. The mission of the USFA is to save lives and reduce economic losses due to fire and related emergencies through training, research, data collection and analysis, public education, and coordination with other Federal agencies and fire protection and emergency service personnel.

The USFA's National Fire Academy offers a diverse course delivery system, combining resident courses, off-campus deliveries in cooperation with State training organizations, weekend instruction, and online courses. The USFA maintains a blended learning approach to its course selections and course development. Resident courses are delivered at both the Emmitsburg campus and its Noble facility. Off-campus courses are delivered in cooperation with State and local fire training organizations to ensure this Nation's firefighters are prepared for the hazards they face.

This course is designed to give the first responder at a hazardous materials incident basic concepts and techniques for appropriate behavior before, during, and after the incident. The course will define hazardous materials, and will describe roles, responsibilities, and risks associated with the incident. Additionally, the course will discuss the limitations of, and identify resources appropriate to, emergency and nonemergency situations.

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# *UNIT 1: INTRODUCTION*

### *TERMINAL OBJECTIVE*

*The students will be able to describe the role of the first responder in a hazardous materials incident and identify related training requirements.*

### *ENABLING OBJECTIVES*

*The students will:*

1. *Recognize differences between hazardous materials and normal suppression operations.*
2. *Identify the major responsibilities of a first responder in a hazardous materials incident.*
3. *Describe the purpose of the course and recognize the value of training.*
4. *Identify general topics covered in the course.*

## INTRODUCTION

**Hazardous materials incidents** are not the same as fire suppression or other "normal" emergency operations. The nature of the hazard requires different protective equipment, operational approaches, skills, and attitudes. For you to respond safely to a hazardous materials incident, you have to be trained and prepared mentally. **What you don't know can kill you.**

A hazardous material (i.e., haz mat) is any substance (e.g., solid, liquid, or gas) capable of causing harm to people, property, and the environment. A haz mat incident involves the actual or potential release of hazardous materials. As in most emergencies, **local government** is the first line of defense against haz mat incidents. Local government is responsible for planning and developing an emergency management **system** that is capable of effective and timely response in a haz mat emergency. Although other levels of government--State and Federal--may be called in to help, only local government can fulfill this critical role.

The primary resource available to local government to defend against hazardous materials emergencies is well-trained and motivated first responders. **The first responder is the individual who arrives first on the scene of a haz mat incident with the responsibility to act**. For our purposes, first responders are emergency response personnel, not members of the public, who may arrive on the scene first. This includes fire service, law enforcement, Emergency Medical Services (EMS), public works, and industry personnel.

## THE ROLE OF THE FIRST RESPONDER

The role of hazardous materials first responders is limited because, by definition, they are trained to function primarily in a **defensive** mode. Their foremost goals are to act safely, limit potential exposure to all persons, and provide timely information to the proper authorities. Additional training is required for more aggressive actions.

The first responder's responsibilities can be defined under the following four general categories.

### Recognition and Identification

- recognize the presence of hazardous materials;
- identify the material, if possible; and
- gather information.

## Notification

- notify the proper authorities;
- call for assistance; and
- provide updates.

## Isolation

- set perimeters/zones;
- deny entry; and
- evacuate.

## Protection

- initiate the Incident Command System (ICS);
- protect responders/public;
- initiate decontamination; and
- initiate defensive actions only (no intentional contact).

# Activity 1.1

## Personal Evaluation Instrument

### Purpose

To help you evaluate your understanding of related concepts.

### Directions

1. On the following Worksheet, individually, circle the letter which most accurately completes each of the sentences.

2. You have 5 minutes to complete the Worksheet.

3. The instructor will lead a discussion of the correct answers. No grade will be given to this quiz.

## Activity 1.1 (cont'd)

## Personal Evaluation Instrument

## Worksheet

**Directions:** From the four choices given, circle the letter which most accurately completes each of the sentences.

1. Among the following groups the ones that would **not** be considered first responders at a hazardous materials incident are

   a. firefighters, police, and EMS personnel.

   b. public works department personnel.

   c. private industry response personnel.

   d. members of the general public.

2. As defined by the Department of Transportation (DOT), substances or materials capable of posing an unreasonable risk to health, safety, and property are

   a. hazardous materials.

   b. hazardous waste.

   c. hazardous substances.

   d. extremely hazardous substances.

3. In highway transportation, the percentage of hazardous materials carried is approximately

   a. 10 percent.

   b. 25 percent.

   c. 50 percent.

   d. 70 percent.

4. The law that mandates that local governments participate in hazardous materials planning and training through Local Emergency Planning Committees (LEPC's) is

   a. The Clean Water Act (CWA) of 1970.

   b. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980.

   c. The Superfund Amendments and Reauthorization Act of 1986 (SARA).

   d. OSHA 29 CFR 1910.120.

5. The maximum allowable concentration that a person can be exposed to over a given period of time without toxic effect is defined as the

   a. lethal dose--50 percent. ($LD_{50}$).

   b. $LC_{50}$.

   c. threshold limit value (TLV).

   d. immediately dangerous to life and health (IDLH).

6. The primary control method upon which first responders must rely in hazardous materials incidents can be categorized as

   a. physical.

   b. environmental.

   c. biological.

   d. procedural.

7. Prevention of contamination is the responsibility of

   a. the Incident Commander (IC).

   b. the Safety Officer.

   c. all haz mat team members.

   d. all emergency responders.

8. The hazards **not** typically associated with the hot zone in a hazardous materials incident are

   a. thermal and chemical hazards.

   b. asphyxiation and radiation hazards.

   c. electrical and environmental hazards.

   d. etiological and mechanical hazards.

9. The suit or equipment designed for use in performing critical functions in limited direct flame contact is

   a. structural firefighting equipment.

   b. an entry suit.

   c. a proximity suit.

   d. Level A chemical protective equipment.

10. The phase that involves the detailed washing of the entire body to remove any residual contamination is

    a. gross decontamination.

    b. cross decontamination.

    c. direct decontamination.

    d. secondary decontamination.

## VIDEO: "FIREFIGHTER SAFETY"

During the video and class discussion, take notes in the space below. In particular, pay attention to these points:

- the speed with which incidents can deteriorate;
- differences between hazardous materials and "normal" emergency operations;
- reasons why problems occurred and ways they might have been avoided; and
- the proper role of first responders.

**NOTES:**

## *INTIAL RESPONSE TO HAZARDS MATERIALS INCIDENTS: BASIC CONCEPTS* PROGRAM OVERVIEW

Training for first responders is mandated by Federal regulation--Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.120 and Environmental Protection Agency (EPA) 40 CFR 311. (Excerpts from these regulations can be found in the Appendix of this manual.) The National Fire Academy (NFA) has developed two integrated field courses that provide progressively indepth training to help potential responders meet or exceed levels of knowledge and competency specified in OSHA/EPA regulations and National Fire Protection Association (NFPA) standards:

- *Basic Concepts*; and
- *Concept Implementation*.

### Course I: *Basic Concepts*

In general, basic concepts and techniques related to hazardous materials first response are covered in Course I. Instruction is designed to prepare first responders to ensure personal safety and to initiate **appropriate** actions. In addition, the course contains basic materials that may be of use or interest to technicians, specialists, Incident Commanders (IC's), special employees, and trainers. No prior comprehensive hazardous materials knowledge is assumed.

### Course II: *Concept Implementation*

Information presented in the first 2-day course is reinforced and expanded upon in Course II through general application in an operational context. More detail and new concepts are provided on procedures, usage, and related considerations, following the basic chronology of a hazardous materials incident. It is recommended that students have taken NFA's *Incident Command System* (ICS) course or equivalent training prior to taking this course.

### Goals for Course I: *Basic Concepts*

Goals for the *Initial Response to Hazardous Materials Incidents: Basic Concepts* course, which are derived from applicable Federal regulations, have been identified as follows:

- Define hazardous materials and describe associated risks to personal safety.
- Explain the roles, responsibilities, and limitations of first responders in hazardous materials incidents.
- Implement appropriate behaviors before, during, and after a hazardous materials incident.
- Identify the presence and potential dangers of hazardous materials in different emergency situations.
- Identify local, State, and Federal resources appropriate to emergency and nonemergency situations.
- Describe basic concepts and techniques of site management and scene setup, including the proper use of personal protective equipment (PPE) and decontamination.

## SUMMARY

Local government is the first line of defense against hazardous materials incidents. Remember, hazardous materials response is different from "normal" emergency operations. Unless you are trained adequately, your role as a first responder in a haz mat incident is limited to defensive operations. Responsibilities include recognizing and identifying the hazard, notifying proper authorities, isolating the area, and protecting responders and the general public. Learning the requirements and limitations of this role may save your life!

OSHA/EPA regulations and NFPA standards define two levels of first responders: **awareness** and **operations**. You will learn more about these levels in Unit 2: Regulations and Standards. For now, note that Course I: *Basic Concepts* focuses on information needed by **all** responders and exceeds the requirements specified for the awareness level. Both courses together meet or exceed requirements for the operations level, although psychomotor skills are not addressed.

# APPENDIX

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**INITIAL RESPONSE TO HAZARDOUS MATERIALS INCIDENTS: BASIC CONCEPTS**

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**PURPOSE OF COURSE**

**To prepare first responders to deal effectively with hazardous materials incidents**

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**ROLE OF LOCAL GOVERNMENT**

- **It is the Nation's first line of defense against most hazards, including hazardous materials incidents.**
- **No other level of government can provide such protection.**
- **This role must include planning and training.**

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## LOCAL GOVERNMENT FIRST RESPONDERS

- **They are local government's primary operational resource.**
- **They must operate safely and effectively to protect the public.**
- **They must plan and train to be safe and effective.**

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## FIRST RESPONDERS

- **First on scene with responsibility to act**
- **Emergency medical services (EMS), fire service, law enforcement, industry, etc.**

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## RESPONSIBILITIES OF FIRST RESPONDERS

- **Recognition and identification**
- **Notification**
- **Isolation**
- **Protection**

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**First responders, by definition, are adequately trained only to conduct primary defensive operations.**

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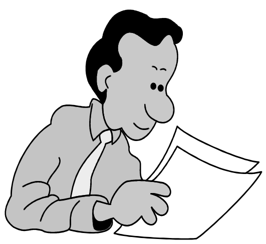
**Activity 1.1**



**Personal Evaluation Instrument**

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**VIDEO: "FIREFIGHTER SAFETY"**

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## *INTIAL RESPONSE TO HAZARDS MATERIALS INCIDENTS* PROGRAM

- **Course I:** ***Basic Concepts***
- **Course II:** ***Concept Implementation***

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## COURSE GOALS

**The students will be able to :**

- **Define hazardous materials and describe associated risks to personal safety.**
- **Explain the roles, responsibilities, and limitations of first responders in hazardous materials incidents.**

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## COURSE GOALS (cont'd)

- **Implement appropriate behaviors before, during, and after a hazardous materials incident.**
- **Identify the presence and potential dangers of hazardous materials in different emergency situations.**

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## COURSE GOALS (cont'd)

- **Identify local, State, and Federal resources appropriate to emergency and nonemergency situations.**
- **Describe basic concepts and techniques of site management and scene setup, including the proper use of personal protective equipment (PPE) and decontamination.**

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## COURSE OVERVIEW

- **Unit 1: Introduction**
- **Unit 2: Regulations and Standards**
- **Unit 3: Personal Safety**
- **Unit 4: Toxicology**
- **Unit 5: Introduction to Recognition and Identification**

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## COURSE OVERVIEW (cont'd)

- **Unit 6: Site Management and Scene Setup**
- **Unit 7: Personal Protective Equipment**
- **Unit 8: Decontamination**

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## COURSE OVERVIEW (cont'd)

- **Unit 9: Resources**
- **Unit 10: Course Wrap-Up**
- **Posttest**

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## OSHA/EPA REGULATIONS AND NFPA STANDARDS FOR FIRST RESPONDERS

- **Awareness**
- **Operations**

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## STUDENT MANUAL

- **Contains course objectives**
- **Has a text that parallels the presentation**
- **Has a note-taking slide guide**
- **Contains the learning activities**
- **Has appendices with Federal regulations**

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## SUMMARY

- Local government is the first line of defense against hazardous materials incidents.
- Hazardous materials operations require different procedures and special training.
- First responders emphasize personal safety and defensive operations.
- The role of the first responder includes recognition and identification, notification, isolation, and protection.
- This information could save your life!

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# *UNIT 2: REGULATIONS AND STANDARDS*

### *TERMINAL OBJECTIVE*

*The students will be able to identify and describe the important laws, regulations, and standards that apply to hazardous materials initial response.*

### *ENABLING OBJECTIVES*

*The students will:*

1. *Identify the regulatory basis for four terms used commonly to describe hazardous materials.*

2. *List three laws, two regulations, and three standards that apply specifically to hazardous materials response and responders.*

3. *Describe the concept of Standard of Care.*

4. *Determine the role played by standard operating procedures (SOP's) in fulfilling the requirements found in the Standard of Care.*

## INTRODUCTION

This unit describes the role of chemicals in our society and defines terminology related to hazardous chemicals. It describes Federal regulations that apply to the use and disposal of hazardous chemicals, as well as government responsibilities in hazardous materials incidents. The unit also discusses levels of training for first responders in hazardous materials incidents and the concept of Standard of Care.

## HISTORICAL BACKGROUND

### Chemicals in Society

Society has studied and used chemicals in various forms for thousands of years. Documented evidence exists of the ancient Greeks naming, studying, and finding uses for many different chemicals available in their time. As the human race progressed in knowledge and technology, so did our knowledge and use of chemicals.

### Early Efforts

By the time we reached the Dark Ages, our curiosity and desire to manipulate nature led to the beginnings of modern chemistry. The nobility of the time was looking for new ways to acquire wealth. To that end, a specialized group, the alchemists, arose. They had one primary goal--the creation of gold from base materials, (lead, iron, copper, etc.).

The work of early alchemists was most definitely a hit-or-miss affair. They understood little if anything about what they were doing. There are accounts of extremely violent and even lethal experiments taking place. It is safe to say that as these tinkerers tried different chemical concoctions, the potential existed for very rapid turnover in the position.

Over time, the alchemists became more and more methodical and scientific in their approach, and they made tremendous strides in understanding the world around them. The alchemists and their trial-and-error investigations evolved into chemistry.

In 1869, the Russian chemist, D.I. Mendeleev (1834-1907) established the principle of periodicity. As his work continued, Mendeleev developed the first periodic table of elements, the forerunner of today's periodic chart. So accurate was his principle that Mendeleev predicted the existence of several elements not proved to exist until much later. Mendeleev's contribution to modern chemistry cannot be overstated.

### Chemical Revolution

Today we have reached a point of development that would have astounded Mendeleev. As of 2003, approximately 24.5 million different compounds were registered with the Chemical Abstract Service (CAS) of Columbus, Ohio. In 1988 alone, CAS added over 600,000 substances to its files, an average of 60,000 **per month**. Over the 22-year period, from 1981 to 2003, an average of over 720,000 substances have been added annually to the CAS listing. This is not to say that all of these compounds are hazardous or found in commercial production, but rather that they have been developed. Many, if not most, will some day find their way into production.

To understand more fully the phenomenal growth in the number of synthetic substances, let's examine some figures. In 1965 (the first year that such information was available), CAS listed 211,934 substances in its files. At the end of 2002, the number had increased to 2,500,000. The estimated total for 1989 was approximately 10 million substances. In essence, we find that the number of compounds listed with the CAS has **increased over 114 fold in only 38 years.**

It is important to keep sight of one simple factor in this discussion. Simply stated, our problems with hazardous materials have not been with us for very long. As we created more and more chemicals, we increased the **magnitude** and altered the **nature** of the problem that we face.

## CLASSIFICATION SYSTEMS FOR CHEMICALS

Different systems have been developed for classifying this overwhelming number of compounds and mixtures of chemicals. These systems evolved over the past 15 to 20 years, as our experience with chemicals grew. Most of the commonly used classification systems were developed by government regulatory agencies, such as the U. S. Department of Transportation (DOT), the Environmental Protection Agency (EPA), and the Department of Labor's Occupational Safety and Health Administration (OSHA). Each of these regulatory agencies addresses a different set of problems. As a result, there are major differences in how compounds are classified, depending upon who does the classification. This situation can lead to confusion and misinterpretation. So, let's take a moment to examine some of the different terms that may be encountered.

## Hazardous Materials

The term "hazardous materials" was first defined by DOT in 1975. Hazardous materials are defined and regulated in the Code of Federal Regulations (CFR), Title 49, Parts 100 to 180 (49 CFR 100-180). The specific definition for hazardous materials is found in Section 171.8, which states that a hazardous material is "a substance or material which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported..."

A specific listing of hazardous materials is found in 49 CFR 172.101 and its appendices. **Remember, in this definition, the term "hazardous materials" refers to materials being transported.**

## Hazardous Substances

The term "hazardous substances" is defined by EPA, DOT, and OSHA and in related Federal legislation, including the **Comprehensive Emergency Response, Compensation, and Liability Act** (CERCLA) of 1980. By OSHA's definition, a hazardous substance is "any material that can produce an adverse effect on the health or safety of the person exposed." Included in this definition are materials listed in section 101(14) and 101(33) of CERCLA and hazardous materials as listed in 49 CFR 172.101 and appendices.

## Hazardous Waste

The term "hazardous waste" is defined by EPA and DOT and regulated in 40 CFR, section 261 et al. In essence, a hazardous waste is any waste material that is ignitable, corrosive, reactive, or "toxic" and "which may pose a substantial or potential hazard to human health and safety and to the environment when improperly managed." Basically, this means that hazardous waste has the ability to cause damage to living organisms and/or the environment.

One of the primary differences between hazardous wastes, substances, and materials is the **intended usage** of the material. If the material is intended to be used in production, manufacturing, and so on, it is a hazardous material or substance. However, if it is intended for disposal, it is a hazardous waste. Consider gasoline. When gasoline is used as a fuel and is in its intended container, it is a hazardous material. However, if the same gasoline is spilled or has leaked into the ground, it is now a hazardous waste, because it is no longer intended for use.

### Extremely Hazardous Substances

The term "extremely hazardous substances," as the name implies, refers to products that have an extremely high degree of toxicity. The EPA established a system to identify these materials. The list has included as many as 403 chemicals, but now totals about 360. Due to the high degree of toxicity involved, facilities are mandated to report the presence of specified quantities of these chemicals to local, State, and Federal authorities. The purpose of this reporting is to help State and local officials identify locations requiring immediate attention for response planning.

If you find this series of definitions confusing, you are not alone. It is not necessary to know the specific definition of each of these types of chemicals. Rather you need to understand the following:

- There are different terms used to classify various chemicals depending upon their intended **use**, **type** of hazard, and **degree** of hazard.

- When we use the term "hazardous materials" in this course, we are generically referring to any chemical that falls into one or more of the four categories.

- For the purposes of this course, hazardous materials (haz mat) are defined as any chemical that, if improperly handled, is capable of harming people, animals, plants, or the environment.

## STANDARD OF CARE

It is important that you understand the basic concept of Standard of Care (SOC) and, specifically, what is involved. This section will provide you with a better understanding of the following:

- what is meant by the term "Standard of Care";
- what specific laws, regulations, standards, and guidance make up the Standard of Care; and
- how the Standard of Care affects the way response agencies and personnel must operate.

## What is the Standard of Care?

Suppose some morning you wake up and just don't feel quite right. You feel sick enough that you decide to call your family doctor for an appointment, only to find he/she is on vacation. You are referred to another doctor. When you arrive at the other doctor's office, you explain your symptoms and the doctor proceeds to give you a very quick, rough examination. Upon completing the examination, the doctor states that obviously you are suffering from a viral infection. He/She goes on to state that the only effective way to treat this virus is to run around an oak tree three times and then place ice on your ears. You are told to repeat this practice three times a day. At that point you say, "Thank you, no," and immediately leave the office.

Why would you leave the office and not follow the doctor's advice? You would leave because you expect a certain level of performance when you go to see a doctor, and you know that the prescribed remedy is not standard treatment. This particular doctor is obviously not providing the level of performance nor displaying the competence expected by or from the medical profession.

This little story addresses the primary concepts involved in Standard of Care. In general, **Standard of Care is the level of competency anticipated or mandated in the performance of a service or duty**. This definition provides only part of the answer. Defining Standard of Care is straightforward, but fully understanding what it implies is something more elusive.

## Components of the Standard of Care

**First**, how do you define "competency?" Competency involves many factors. "Accepted practices" found within a profession, trade, etc., are one factor. Such accepted practices are often reflected in professional, industrial, or governmental standards and licensing requirements. Another factor includes moral, ethical, and political issues. Normally, these factors involve legislative requirements set forth in laws or ordinances. A final factor includes the court's interpretations and opinions.

**Second**, it is vital that you understand that the Standard of Care for any given situation or profession is not static but dynamic--in other words, changing. The change in Standard of Care usually is due to a change in what is deemed "competent." As our knowledge and understanding change and expand regarding a specific problem or situation, so does competence. On the other hand, we may also find that our moral or ethical beliefs change. And we may find changes in how the judicial system interprets, defines, or reinterprets acceptable practices.

An example of knowledge-based change involves the use of aspirin for the reduction of fever. As recently as the past 15 to 20 years, the Standard of Care stated that children suffering from fever should routinely receive aspirin. However, the medical profession found a high correlation between the use of aspirin and a potentially fatal neurological complication known as Reye's syndrome. As a result of this **new** information, the Standard of Care has been modified drastically. Now, children with fever should not receive aspirin, but, rather, may be treated with a nonaspirin pain reliever.

An example of a moral or ethical-based change in the Standard of Care involves punishment for theft. In the old days, a thief may have been hanged for stealing a horse. This punishment would not be allowed today, at least not in this country.

Finally, the courts can change the Standard of Care simply by making a ruling on a specific case. An example of a court-mandated change in the Standard of Care involves an individual's right to remain silent. Before the Miranda decision, police were not required to inform persons of their rights. However, after Miranda, police not only have to read a suspect his or her rights, they also have to make sure that the individual fully **understands** those rights.

## Hazardous Materials Standard of Care

Unfortunately, the chemical revolution went relatively unnoticed by most people outside of the chemical and related industries. The public was left wondering what was going on. How big and bad is this problem? Who do we believe: those who say there is no problem or those who say we are on the verge of a catastrophe?

The incident at Bhopal, India, in 1984 brought the potential for disaster into clear focus. The release of methyl isocyanate (MIC) led to between 3,000 and 5,000 deaths and possibly as many as 200,000 to 300,000 long-term health impacts. This one incident, probably more than any other single event, points out that we live in a world that has the potential for major chemical disasters.

There were many other incidents prior to Bhopal that spurred a change in national policy and directly affected emergency responders. For example, in the late 1960's and into the 1970's, a large number of rail incidents occurred that involved liquefied petroleum gas (LPG) and fire. Very often, the result of such situations was a Boiling Liquid Expanding Vapor Explosion (BLEVE).

As the causes of these BLEVE's were identified, steps were taken to prevent future occurrences. This process involved retrofitting specific types of railcars with thermal protection, head-shields, and shelf-couplers. As a result, the number of derailments involving BLEVE's has dramatically decreased.

In 1968, an oil tanker, the *Torrey Canyon*, ran aground off the shore of England. Approximately 36,000,000 gallons of crude oil were lost from the vessel. (Note: The *Exxon Valdez* only lost about 11,000,000 gallons.) This massive oil spill and environmental nightmare caused officials in the United States to question our ability to handle such a catastrophic release.

As a result of this history of chemical emergencies, it became evident that something had to be done. In 1968, after the *Torrey Canyon* incident, the government started to take steps to develop a systematic methodology or standard for response to chemical incidents. The system that developed can be referred to as the "Standard of Care" for emergency response to hazardous materials incidents.

With the events that occurred in the late 1990's and in 2001 with Oklahoma City, The World Trade Center, and Pentagon it has become painfully obvious that Standard of Care has become a dynamic entity and brought this concept to a global level.

## Legal Implications of the Standard of Care

The existence of a hazardous materials Standard of Care has potential legal implications for emergency response agencies and employees. One of the primary implications is liability. Webster defines liability as, "the state of being liable." Being liable means that some individual, group, or agency is legally bound or responsible to perform or provide a function, duty, or service.

The Standard of Care establishes duties and responsibilities. But assigning responsibility does not necessarily imply liability. The primary concern with regard to liability is negligence. **Negligence** is the failure to perform one's duty or responsibility with reasonable regard for foreseeable harm to another. **Gross negligence** is the willful or, in some cases, almost willful failure to perform one's duty or responsibility.

In order to establish negligence, a party must prove that:

- A duty or responsibility was owed.

- There was a failure to perform that duty within the realm of a Standard of Care.

- Damage occurred.

- The failure to perform the duty or responsibility resulted in the damage.

In most negligence lawsuits, there are only four avenues of defense.

1. The defendant may try to prove that no duty or responsibility exists. Obviously, this would be difficult if the suit revolved around one or more of the responsibilities identified in existing laws, regulations, and standards.

2. The defendant may try to prove that no Standard of Care exists. Again, this could be very difficult to prove in light of these documents.

3. The defendant may try to prove that the Standard of Care was not violated. This defense will need to substantiate these claims.

4. The defendant may try to prove no injury occurred or that injury did not result from a violation of the Standard of Care or was not foreseeable.

There are few case law precedents in the area of hazardous materials. Most legal actions have not involved governmental agencies as the plaintiffs (other than chemical reporting noncompliance). Rather, private citizens, public interest groups, and others at the local level have initiated most of the actions. This trend most likely will continue. As time passes, employees will probably constitute a major group of plaintiffs. It would be a mistake for anyone to think that the primary liability concern is with Federal or State government. The greatest potential liability exposure is definitely at the local level.

It is important to understand that, not only must response agencies or organizations meet the Standard of Care, so must the first responder. Your actions during an emergency must be in line with the Standard Operating Procedures (SOP's) developed for hazardous materials response. The SOP's must be developed in conformity with the requirements of the regulations and standards. If this is not the case, a potential liability exists not only for the agency, **but for the responder as well**.

Hazardous materials response indeed is dangerous and difficult. That is precisely why the Standard of Care has developed.

## Standard of Care Matrix

As we have said, the past 20 to 25 years have led to a tremendous increase in our knowledge about hazardous materials and related problems. As a result, we have seen the growth and development of numerous laws, regulations, and standards specifically aimed at meeting the challenges faced by emergency responders. In essence, the laws, regulations, and standards come together to form the framework for the Standard of Care by which you will be judged. They are summarized in a matrix on the next page and discussed in the following sections.

## Standard of Care Matrix

| | Responder Health and Safety | Right-To-Know/ Planning | National Response System | Training Requirements | Response Procedures | Transportation |
|---|---|---|---|---|---|---|
| **Federal Legislation** | | | | | | |
| Clean Water Act | | | √ | | √ | |
| CERCLA (Superfund) | | | √ | | √ | |
| SARA | √ | √ | | √ | √ | |
| HMTUSA | √ | | | √ | √ | |
| **Federal Regulations** | | | | | | |
| EPA 40 CFR 300 | | | √ | | √ | |
| OSHA 29 CFR 1910. 120 EPA 40 CFR 311 | | | | √ | √ | |
| DOT 49 CFR100-199 | | | | | | √ |
| **Consensus Standards** | | | | | | |
| NFPA 471 | √ | | | | √ | |
| NFPA 472 | √ | | | √ | | |
| NFPA 473 | √ | | | √ | | |
| **Guidance/ Programs** | | | | | | |
| NRT-1 | | √ | | | √ | |
| CPG 1-8 | | √ | | | | |
| CAER | | √ | | | √ | |

Key to abbreviations:

Clean Water Act--Federal Water Pollution Control Act of 1970 and Amendments
CERCLA--Comprehensive Environmental Response, Compensation, and Liability Act of 1980
SARA--Superfund Amendments and Reauthorization Act of 1986
HMTUSA--Hazardous Materials Transportation Uniform Safety Act 1990
EPA 40 CFR 300--The National Oil and Hazardous Substance Contingency Plan
OSHA 29 CFR 1910.120/EPA 40 CFR 311--Hazardous Waste Operations and Emergency Response
NFPA 471--*Recommended Practice for Responding to Hazardous Materials Incidents*
NFPA 472--*Standard for Professional Competence of Responders to Hazardous Materials Incidents*
NFPA 473--*Standard for Competencies for EMS Personnel Responding to Hazardous Materials Incidents*
NRT-1--Hazardous Materials Emergency Planning Guide
CPG 1-8--FEMA Civil Preparedness Guide 1-8
CAER--Community Awareness and Emergency Response Program

# FEDERAL LEGISLATION

## Federal Water Pollution Control Act (The Clean Water Act) of 1970 and Amendments

In 1970, a law commonly referred to as the Clean Water Act (CWA) was passed. The CWA (and its subsequent amendments) mandated the establishment of a National Response System (NRS) primarily for the management of oil spills in navigable waters and their tributaries. This legislation required the Federal government to develop "a coordinated and effective action" to minimize the damages resulting from oil and hazardous substance releases.

Additionally, CWA established the National Response Team (NRT), tasked to implement the Federal response to such emergencies. The NRT is comprised of representatives of various Federal agencies with major environmental, transportation, emergency management, worker safety, and public health responsibilities. The NRT is responsible for developing and maintaining the National Contingency Plan (NCP). The NRT **does not** respond to the incident. It is a **coordination** team and usually works out of Washington, DC.

## Comprehensive Environmental Response, Compensation, and Liability Act of 1980

In 1980, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), was passed. Most people are familiar with CERCLA because it started the original Superfund for the cleanup of hazardous waste dump sites around the country. CERCLA also mandated changes to the NCP and extended the liability of the spiller to cover the costs of the cleanup. In general, the act broadened the scope and scale of Federal involvement in hazardous materials situations. However, the primary focus was still hazardous waste dumps and oil spills in navigable waters.

## Superfund Amendments and Reauthorization Act of 1986

In 1986, the Superfund Amendments and Reauthorization Act (SARA), was passed. As the name implies, SARA acted to amend and reauthorize CERCLA. Again, a major focus was on hazardous waste site cleanup, but this act **added** many requirements that never existed before. In essence, SARA established a **national** baseline with regard to planning, response, management, and training for chemical emergencies.

SARA Title I requires OSHA to establish training requirements for hazardous waste and emergency response personnel (Sec. 126). Title III of SARA mandates the establishment of State and local planning groups specifically to review or develop hazardous materials response plans. Title III also requires that the NRT develop guidance documents to assist in the preparation and implementation of emergency plans.

As part of the planning process, facilities that have specified quantities of specific hazardous substances must provide certain information, including inventories or Material Safety Data Sheets (MSDS) to local and State planning groups and the local fire department. If sufficient quantities of these materials exist, the facility also must identify a contact person for the State and local planning groups. Additionally, the facilities and planning groups are required to provide information regarding inventories or lists of chemicals to the medical community, citizen groups, or individual members of the public.

SARA mandates that States establish a mechanism through the State Emergency Response Commission (SERC) to ensure that planning and training take place and to provide assistance to local governments. The SERC is responsible for developing and maintaining the State's response plan. As part of the plan, States generally provide an important source of technical specialists, information, and coordination. However, they typically provide only minimal operational support to local jurisdictions in the form of equipment, materials, or personnel.

Local government is assigned a role in planning and training through the Local Emergency Planning Committee (LEPC). The LEPC is responsible for developing the local response system and capabilities. A primary focus is the identification, coordination, and effective management of local resources.

## Hazardous Materials Transportation Uniform Safety Act

Originally HMTUSA, but now simply referred to as HMTA, this piece of legislation integrated the United States with international hazardous materials shipping requirements. It enhanced the nine-digit hazard class system with divisions and packing groups. It added more and different placarding and packaging categories as well as additional licensing requirements. It required additional planning to be developed, and provided a mechanism for the funding of training programs. Finally it required the creation of National Curriculum Guidelines for hazardous material responders.

## FEDERAL REGULATIONS

Federal or State **regulations** also play a major role in establishing the Standard of Care. This portion of the text addresses the specific Federal regulations that apply to hazardous materials planning, prevention, or response. However, before we go on, it is important to understand exactly what Federal regulations are and the role that they play.

Regulations are **mandatory standards**. They are authorized by specific legislation (laws) and are written by the responsible agencies or departments. Although regulations are **not laws**, they carry the **same weight as laws** due to the legislative authorization for their development.

Federal regulations are printed by the government and are available for purchase. The regulations are broken into 50 "Titles" and published in books called the "**Code of Federal Regulations**" (CFR). Changes, additions, or deletions in the CFR are published on an almost-daily basis in a document known as the **Federal Register**.

### Environmental Protection Agency 40 CFR Part 300--The National Oil and Hazardous Substance Contingency Plan

As previously mentioned, the NCP deals with the NRS and how it functions. In today's system, regulations underlying the NCP are found in the EPA 40 CFR Part 300.

The NRS is a tiered system. At the top is the NRT, which was previously discussed. At the next level is the Regional Response Team (RRT), which coordinates Federal and State agencies in each of 13 regions. The RRT becomes involved in large incidents and actually may respond to the scene.

The Federal Onscene Coordinator (OSC) also is found at this level. The OSC is a predesignated member of EPA or the Coast Guard (depending on the location of the emergency). This person has the authority to bring Federal resources to bear on the incident. The OSC may or may not respond to the actual incident site.

### Occupational Safety and Health Administration 29 CFR Part 1910.120, Environmental Protection Agency 40 CFR Part 311--Hazardous Waste Operations and Emergency Response

OSHA 1910.120 and EPA 311 are identical regulations mandated by SARA. The reason both OSHA and EPA promulgated these regulations is that OSHA regulations apply only in States with their own OSHA agencies, while EPA regulations would apply to all other States. In short, these regulations apply to **everyone**, whether you are in an OSHA State or not.

Many of the provisions in these regulations apply specifically to hazardous waste site operations. However, the final portion addresses emergency response. These regulations include some very important concepts, including the definition of an emergency response, the organization of work groups using the "buddy system," what constitutes a hazardous materials response team, what is included in the term "hazardous substance," health hazards considerations, and so on.

The regulations mandate medical monitoring and annual physicals for specific response personnel. Requirements for the development of specific emergency response plans for response agencies are examined. A type of response management system, known as the **Incident Command System** (ICS), also is mandated. (The ICS will be discussed in Unit 6: Site Management and Scene Setup.)

At the center of the ICS is the use of an overall commander known as the Incident Commander (IC). The IC is responsible for coordinating and controlling all onscene response activities and operations. A **knowledgeable** Safety Officer also must be assigned to identify and evaluate hazards and to ensure the safe conduct of the operation. The regulations also address requirements for protective clothing and operational procedures, as well as emergency medical support. Finally, the regulations address the need for competency-based training for personnel.

With regard to the training requirements, **all** responders must receive minimum levels of training, depending upon the **roles and functions** they will fill and perform. There are **five** basic levels of training:

1. First responder at the awareness level.

2. First responder at the operations level.

3. Hazardous materials technician.

4. Hazardous materials specialist.

5. Onscene Incident Commander.

## First Responder at the Awareness Level

First responders at the awareness level are individuals who are likely to witness or discover the release of a hazardous substance. Their primary functions are to notify proper authorities that a release has occurred, and to initiate an appropriate response. They also may establish isolation areas.

This category of responder includes all police officers and may include emergency medical personnel as well as private sector employees.

## First Responder at the Operations Level

First responders at the operations level are part of the initial response to a hazardous substance release for the purpose of protecting people, property, and the environment. They function primarily in a **defensive** mode, without actually trying to stop the release. Their function is to contain the release (keep it from spreading) from a safe distance and to prevent exposures. First responders at the operations level must understand an essential form of ICS.

This category of responder typically includes all firefighters, and may apply to emergency medical personnel, police officers, and private sector employees, depending on the duties the individuals must perform.

Defensive actions include those taken during a hazardous material incident in which there is no intentional contact with the material involved. They involve notification and possible evacuation, but **not** plugging, patching, or cleanup of spilled or leaking materials. Examples include, but are not limited to:

- elimination of ignition sources;
- vapor suppression; and
- diking or diverting to keep a release to a confined area.

## Hazardous Materials Technician

Hazardous materials technicians are personnel who respond to releases or potential releases for the purpose of stopping the release. They can assume a more aggressive (offensive) mode of operation than first responders at the operations level. They may approach the release in an effort to plug, patch, or in some other fashion stop the release. Training includes the use of appropriate chemical protective clothing.

This category of responder includes all personnel on hazardous materials response teams.

## Hazardous Materials Specialist

Hazardous materials specialists perform activities similar to those of the technician, except that the specialists' responsibilities require a greater depth of knowledge of the substances involved. The specialist acts as the liaison for Federal, State, and local governmental authorities regarding site activities.

This category of responder includes personnel who are hazardous materials team leaders/officers or specialized industrial response personnel.

*Note: The definitions of technician and specialist are not clearly delineated and some overlapping occurs depending on who is interpreting the law.

## Onscene Incident Commander

IC's are individuals who assume control of the incident scene beyond the first responder. Normally, this individual is a fire chief, police officer, or plant safety manager representing the lead agency.

This category of responder includes all personnel who may fill the command position at some time during the emergency. First responders awareness may act as the initial IC, but the initiation of a multilevel ICS is the domain of the operations level.

## Department of Transportation 49 CFR Parts 100 to 180

49 CFR consists of DOT regulations involved in the transportation and classification of hazardous materials. Specifically, this part of the CFR provides information about specific hazardous materials, their identification, and classification.

The regulations identify the types of cargo containers required for the transportation of various types of chemicals in different modes of transportation.

They contain specific information about compatibilities of cargos as well as requirements for identifying hazardous materials shipments through placarding and labeling. Additionally, these regulations establish requirements for shipping papers and product information needed in case of an emergency during transportation. As such, 49 CFR is **the primary enforcement tool** used in the **transportation** of hazardous materials.

## Consensus Standards

As mentioned before, regulations are standards, in particular, mandatory governmental standards. There are other types of standards as well. Here we will address what are known as consensus standards.

**Consensus standards** are standards that are developed by representatives of a specific industry, trade, profession, etc. In other words, a group of people with related competencies and backgrounds meets in order to reach consensus on to how to produce, perform, or specify something.

It is vital to consider the potential implications of the term "consensus." Consensus means that the group reached general agreement with respect to the specification established in the standard. As such, consensus standards carry considerable weight when it comes to legal considerations.

In essence, even though consensus standards must be adopted by an authority having jurisdiction to be mandatory, they still should be considered and properly implemented. The reason is simple. Although they are not mandatory, consensus standards represent what has been deemed to be appropriate behavior by representative members of a profession or trade. As such, these standards explain "the way the job should be done"--the Standard of Care.

In short, in a legal setting, you will be judged not only by mandatory standards (regulations), but also by consensus standards.

### National Fire Protection Association 471, *Recommended Practice for Responding to Hazardous Materials Incidents*

National Fire Protection Association (NFPA) 471 is a standard generated by the NFPA Technical Committee on Hazardous Materials. This standard outlines **minimum** operational considerations and guidelines for incidents involving hazardous materials. This standard, which applies to all responders, addresses considerations such as:

- incident response planning;
- response levels;
- control options;
- personal protective clothing;
- chemical protective clothing;
- decontamination; and
- safety and communications.

### National Fire Protection Association 472, *Standard for Professional Competence of Responders to Hazardous Materials Incidents*

NFPA 472 is also a standard generated by the NFPA Technical Committee on Hazardous Materials. This standard establishes specific knowledge and competence levels that response personnel need in order to respond to hazardous materials incidents safely and effectively. In essence, this standard is the basic training manual for hazardous materials response.

The standard classifies response personnel into four basic levels identical to those in OSHA 1910.120--first responder awareness, first responder operations, hazardous materials technician, and hazardous materials specialist. Any training program based upon the goals and objectives set forth in this document will, in most cases, comply with OSHA mandates. Additionally, in Appendix B, the standard identifies broad knowledge recommended for the IC.

As with most NFPA training standards, this particular standard is competency-based. This means that the personnel receiving training must **demonstrate** the ability to perform specified tasks or functions. Additionally, these personnel will have to demonstrate that they have attained a given level of knowledge regarding specific terminology, concepts, procedures, and activities.

### National Fire Protection Association 473, *Standard for Competencies for Emergency Medical Services Personnel Responding to Hazardous Materials Incidents*

NFPA 473 addresses the specific competencies needed by Emergency Medical Services (EMS) personnel for the management of responders and victims at hazardous materials incidents. This standard is set up in a fashion similar to other NFPA standards.

## Guidance Documents and Other Programs

Many guidance documents and related programs exist to provide direction or to outline specific procedures on various aspects of the hazardous materials problem.

Some of these documents and programs will be discussed later. However, at this point, several are mentioned because of their correlation to the hazardous materials Standard of Care:

- Hazardous Materials Emergency Planning Guide--NRT-1.
- Criteria for Review of Hazardous Materials Emergency Plans--NRT-1A.
- Federal Emergency Management Agency (FEMA) Civil Preparedness Guide (CPG)--CPG 1-8 and CPG 1-8a.
- Chemical Manufacturers Association (CMA) Community Awareness and Emergency Response (CAER) Program.

These guidance documents and programs provide information for the systematic analysis of hazards and specific ways to develop emergency operations systems and plans needed to address the hazards. As such, they comprise an important component of the Standard of Care.

## STANDARD OPERATING PROCEDURES

OSHA 29 CFR Part 1910.120, paragraph (q)(1) contains a requirement for emergency response agencies to develop **Emergency Response Plans (ERP)**. These ERP's must include Hazardous Materials Emergency Response Standard Operating Procedures (SOP's). Stated more simply, the ERP is a plan including nothing more complicated than written SOP's. These SOP's are a series of guidelines that describe how a hazardous materials incident will be managed by the agencies involved. For our purposes, we will refer to the ERP's as SOP's.

Paragraphs (q)(1) and (2) of 1910.120 offer specific recommendations and guidance on the development of the haz mat SOP's. It is important to note that specific information regarding local approaches and procedures should be available through the Emergency Response and Operations Plans developed by your LEPC.

As the SOP's are developed, it is **crucial** to integrate them into the operational system developed by the LEPC in its plan. The LEPC plan is available to everyone, including the public, emergency response agencies, the medical community, the press, etc. This availability is mandated in SARA Title III as part of the community planning and right-to-know requirements of the Act.

Paragraph (q) is reproduced in Appendix D. A model content outline for a hazardous materials emergency SOP follows.

## Model Outline

## Hazardous Materials Emergency

## Standard Operating Procedures

I. Introduction.

- Address basic information in this portion. Refer to the specific reasons for developing this SOP and how and when it is to be followed.

- Indicate what is required of all personnel and how the SOP will be enforced.

- Remember to include specific procedures and approaches set forth in the Local Emergency Planning Committee's (LEPC) Emergency Operations Plan (EOP).

- Indicate the level of response that the agency will conduct. Include specifics about the level of competency that must be shown by the agency (i.e., first responder awareness, first responder operations, technician, specialist, etc.).

II. Preplanning and Coordination.

- Indicate in this portion of the SOP what preincident planning activities will take place and how that information will be shared with other members of the organization.

- Include specific information and methods of obtaining information from the LEPC.

- Explain how your agency will coordinate with other local, State, and Federal agencies and private sector groups.

III. Chain of Command, Communications, and Training.

- Describe the chain of command that will be used within your agency's Incident Command System (ICS). Be sure to consider how your organization's ICS will interact with that of mutual-aid agencies and other local groups.

- Indicate how communications are to flow during an operation. Consider communications within the agency, among different agencies, among mutual-aid organizations, levels of government, etc.

- Identify the level and type of training expected of each level within the response agency.

- Indicate what is deemed appropriate training and how it will be provided.

IV. Alerting and Response Procedures.

- Describe how responders will be alerted and notified of the response.

- Indicate any differences that may exist from the standard alerting system.

- Indicate who is responsible, and how to alert the public if the need should arise.

- Explain how personnel are to respond to chemical incidents, how close they should approach, where they should be looking for hazardous materials, etc.

V. Listings of Personal Protective Equipment and Other Emergency Response Equipment (A Resource List).

- Develop a list of all available types of personal protective equipment (PPE) and other emergency response equipment.

- Indicate how this equipment is to be used and how to request it on an incident scene.

- Indicate who is authorized to request the equipment and the phone numbers of specific contact persons.

VI. Recognition and Identification Procedures.

Identify specific methods to be used by responders that will enable them to determine locations, situations, indications, etc., that should be used to help recognize the presence of hazardous materials and identify them.

VII. Basic Scene Setup Considerations.

- Explain how responders are to set up the incident scene.

- Include specific information regarding isolation, zoning, denial of entry, initial evacuation, assisting agencies, etc.

VIII. Decontamination Procedures.

- Explain what types of decontamination will be performed by personnel.
- Indicate how decontamination areas should be set up and the number of personnel needed.
- Identify the specific roles, responsibilities, and duties of personnel involved in decontamination.
- Indicate how contaminated victims will be managed, versus protected personnel.

IX. Evacuation Procedures.

- Indicate who can authorize an evacuation.
- Explain how the public will be notified and assisted in evacuation.
- Identify the methods to be used in determining the size of the evacuation area.
- Identify how the evacuation centers will be identified and established.

X. Emergency Medical Procedures.

- Indicate exactly what is expected of responders with regard to EMS considerations in hazardous materials incidents.
- Identify the specific protocol to be followed when managing victims of a hazardous materials incident.
- Explain appropriate triage setup and procedures.

XI. Critique.

- Explain when, how, and by whom a critique will be conducted following each hazardous materials incident.
- Identify the specific procedures that will be followed to document the "lessons learned" from the response and critique.

- Identify how these lessons learned will be incorporated into departmental SOP's and training programs.

XII. Documentation.

- Identify the specific types of information that must be compiled, organized, disseminated, and filed. This information must include

  - Incident specifics, e.g., incident number, location, product involved, exact situation, unit locations, evacuation areas, incident zones, timeline, etc.

  - Actions taken, including specific strategic and tactical approaches and rationale used.

  - Notifications and times.

  - Injuries and medical actions.

  - Personal exposure files for **all** response personnel on the scene.

- Indicate who is responsible for compiling the information and how it is to be stored.

- Pay particular attention to information that must remain confidential and that must be entered into personnel files.

- Indicate specific situations that will require followup medical monitoring and file updating.

- Determine the mechanism needed to maintain the integrity and confidentiality of personnel medical record updating and exposure monitoring.

# APPENDIX

Slide 2-1

**UNIT 2:**
**REGULATIONS AND STANDARDS**

Slide 2-1

Slide 2-2

**TERMINAL OBJECTIVE**

**The students will be able to identify and describe the important laws, regulations, and standards that apply to hazardous materials initial response.**

Slide 2-2

Slide 2-3

**ENABLING OBJECTIVES**

**The students will:**

- **Identify the regulatory basis for four terms used commonly to describe hazardous materials.**
- **List three laws, two regulations, and three standards that apply specifically to hazardous materials response and responders.**
- **Describe the concept of Standard of Care.**
- **Determine the role played by standard operating procedures (SOP's) in fulfilling the requirements found in the Standard of Care.**

Slide 2-3

Slide 2-4

**CHEMICALS IN OUR SOCIETY: THE CHEMICAL REVOLUTION**

Slide 2-4

Slide 2-5

**CHEMICAL ABSTRACT SERVICE SUBSTANCE LISTINGS**

- **1965: 211,934 substances**
- **2002: 25,000,000 substances**
- **On an average, 60,000 substances are added monthly**

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Slide 2-6

**CLASSIFICATION SYSTEMS**

- **Hazardous materials--DOT**
- **Hazardous substances—EPA, DOT, and OSHA**
- **Hazardous waste--EPA and DOT**
- **Extremely hazardous substances--EPA**

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Slide 2-7

## 50 YEARS OF EXPERIENCE HAVE SHOWN...

- **Potential incident effects**
- **Appropriate intervention options**
- **A need for responder competency**
- **A need for a Standard of Care**

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Slide 2-8

## STANDARD OF CARE

**The level of competence anticipated or mandated during the performance of a service or a duty.**

Slide 2-8

Slide 2-9

## STANDARD OF CARE IS INFLUENCED BY...

- **Laws and regulations**
- **Standards and guidance**
- **Knowledge and experience**

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Slide 2-10

## STANDARD OF CARE (cont'd)

- **Started in 1968.**
- **It has had its greatest impact from 1986 to 2003.**
- **It is continually changing and evolving. It is dynamic!**

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Slide 2-11

## BASES FOR STANDARD OF CARE

- **The principles of toxicology and industrial hygiene**
- **Incident histories such as Bhopal, India**
- **Local government and first responder roles in planning, preparedness, and training**

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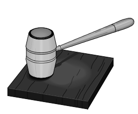
Slide 2-12

## LEGAL IMPLICATIONS OF THE STANDARD OF CARE

- **Liability**
- **Negligence**
- **Gross negligence**



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Slide 2-13

Liability: The state of being liable.

Liable: The owing of a responsibility or duty.

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Slide 2-14

## NEGLIGENCE

- Performance of duty or responsibility without due regard for others
- Performing duty outside of the Standard of Care

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Slide 2-15

## GROSS NEGLIGENCE

The willful or almost willful failure to perform one's duty according to the Standard of Care

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Slide 2-16

## STANDARD OF CARE MATRIX

| | Responder Health and Safety | Right-To-Know/ Planning | National Response System | Training Requirements | Response Procedures | Transportation |
|---|---|---|---|---|---|---|
| **Federal Legislation** | | | | | | |
| Clean Water Act | | | ■ | | ■ | |
| CERCLA (Superfund) | | | ■ | | ■ | |
| SARA | ■ | ■ | | ■ | ■ | |
| **Federal Regulations** | | | | | | |
| EPA 40 CFR 300 | | | ■ | | ■ | |
| OSHA 29 CFR 1910. 120 EPA 40 CFR 311 | | | | ■ | ■ | |
| DOT 49 CFR100-199 | | | | | | ■ |
| **Consensus Standards** | | | | | | |
| NFPA 471 | ■ | | | | ■ | |
| NFPA 472 | ■ | | | ■ | | |
| NFPA 473 | ■ | | | ■ | | |
| **Guidance/ Programs** | | | | | | |
| NRT - 1 | | ■ | | | ■ | |
| CPG 1-8 | | ■ | | | | |
| CAER | | ■ | | | ■ | |

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Slide 2-17

## RELATIONSHIP OF LAWS AND REGULATIONS

- **Laws--enacted legislation**
- **Regulations**
  - **Mandated by law**
  - **Tools to implement law**

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Slide 2-18

## LEGISLATIVE BASIS FOR STANDARD OF CARE

- **Clean Water Act (CWA) of 1970 and amendments**
- **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980**
- **Superfund Amendments and Reauthorization Act (SARA) of 1986**

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Slide 2-19

## THE CLEAN WATER ACT OF 1970 AND AMENDMENTS

- **Established a Federal role in environmental emergencies**
- **Established Federal regulations to address such responses**

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Slide 2-20

## THE CLEAN WATER ACT

**Established**
- **The National Response System (NRS)**
- **The National Contingency Plan (NCP)**
- **The National Response Team (NRT)**

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Slide 2-21

## COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980

- **Commonly known as Superfund Act**
- **Expanded role of NRS**
- **Placed additional emphasis on emergency response**

Slide 2-21

Slide 2-22

**THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 MANDATES...**

- **Community planning and right-to-know**
- **Development of safety standards for response personnel**
- **Development of training requirements as part of safety standards**

Slide 2-22

Slide 2-23

**HAZARDOUS MATERIALS TRANSPORTATION UNIFORM SAFETY ACT OF 1990**

- **Now simple called HMTA.**
- **Integrates the United States with international requirements.**
- **Hazard classes/division systems, packaging.**
- **Placarding, packaging, licensing.**
- **Planning and training funding mechanism.**
- **National Curriculum Guidelines.**

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Slide 2-24

**THE ROLE OF STATE AND LOCAL GOVERNMENT**

- **State Emergency Response Commission--(SERC)**
- **Local Emergency Planning Committee--(LEPC)**

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Slide 2-25

## STATE EMERGENCY RESPONSE COMMISSION

**It provides State-level planning support to local emergency planning.**

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Slide 2-26

## LOCAL EMERGENCY PLANNING COMMITTEE

- **It is responsible for local planning and preparedness.**
- **It is responsible for developing local response capabilities.**
- **It should assure a local ability to manage incidents.**

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Slide 2-27

## REGULATORY BASES FOR STANDARD OF CARE

- **EPA 40 CFR 300 and 311**
- **OSHA 29 CFR 1910.120**
- **DOT 49 CFR 100-180**

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## EPA 40 CFR 300

**National Oil and Hazardous Substance Contingency Plan (the NCP)**

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## EPA 40 CFR 300 (cont'd)

- **National Response Team (NRT)**
- **Regional Response Team (RRT)**
- **Onscene Coordinator (OSC)**

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## OSHA 29 CFR 1910.120 AND EPA 40 CFR 311

**Hazardous Waste Operations and Emergency Response (HAZWOPER)**

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## OSHA 1910.120 REQUIREMENTS

- **Written SOP's and a response plan**
- **Use of the Incident Command System**
- **The presence of a Safety Officer**
- **Use of minimum personal protective equipment such as positive-pressure SCBA's and full turnouts**
- **The presence of backup personnel and emergency medical support**

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Slide 2-32

## FIVE LEVELS OF TRAINING

- **First responder awareness**
- **First responder operational**
- **Hazardous materials technician**
- **Hazardous materials specialist**
- **Incident Commander**

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Slide 2-33

## FIRST RESPONDER AWARENESS

**Persons who may witness or discover a chemical release and will notify proper authorities, secure the area, and establish command**

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Slide 2-34

## FIRST RESPONDER OPERATIONS

- **Initial responders to releases or potential releases of chemicals**
- **Those who function in a defensive fashion without attempting to stop the leak or come into close proximity to the product**

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Slide 2-35

## HAZARDOUS MATERIALS TECHNICIAN

- **Responds in a more aggressive fashion**
- **Trained to use chemical protective equipment**
- **Normally a member of a hazardous materials team**

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## HAZARDOUS MATERIALS SPECIALIST

- **Has more indepth knowledge than a technician**
- **Serves as a team leader**

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**ONSCENE INCIDENT COMMANDER**

**An individual who will assume command of an incident scene beyond the level of the first responder**

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Slide 2-38

**DOT 49 CFR 100-180 HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS**

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**CONSENSUS STANDARDS BASES FOR STANDARD OF CARE**

**NFPA Standards 471, 472, and 473**

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## NATIONAL FIRE PROTECTION ASSOCIATION STANDARDS

- **Nonmandatory if not adopted**
- **Consensus standards**
- **Part of Standard of Care**

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## NFPA 471

***Recommended Practice for Responding to Hazardous Materials Incidents***

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## NFPA 472

***Standard for Professional Competence of Responders to Hazardous Materials Incidents***

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## NFPA 473

***Standard for Competencies for Emergency Medical Services Personnel Responding to Hazardous Materials Incidents***

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## GUIDANCE DOCUMENTS AND OTHER PROGRAM BASES FOR STANDARD OF CARE

- **National Response Team-1 (NRT-1)**
- **Civil Preparedness Guide (CPG 1-8)**
- **CAER Manual**
- **Other industrial and governmental publications**

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## STANDARD OF CARE SUMMARY

- **Laws are carried out through regulations.**
- **Consensus standards come from peer groups.**
- **Guidance is provided for specialty areas.**
- **Knowledge and experience also are important.**

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**ELEMENTS OF A HAZARDOUS MATERIALS STANDARD OPERATING PROCEDURE**

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**INTEGRATION OF PLANNING**

- **Plans and SOP's must be integrated.**
- **The LEPC plan covers the whole jurisdiction and involves all responders.**
- **Private employers must develop emergency response plans and SOP's.**

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**STANDARD OPERATING PROCEDURE ELEMENTS**

- **Preplanning and coordination**
- **Chain of command**
- **Communications and training**
- **Alerting and response procedures**
- **Roles and limitations of responders**

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## STANDARD OPERATING PROCEDURE ELEMENTS (cont'd)

- **Recognition and identification procedures**
- **Basic scene setup considerations**
- **Decontamination and setup procedures**
- **Available personal protective equipment and emergency response equipment**

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## STANDARD OPERATING PROCEDURE ELEMENTS (cont'd)

- **Evacuation procedures**
- **Emergency medical treatment**
- **First aid considerations**

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## STANDARD OPERATING PROCEDURE ELEMENTS (cont'd)

- **Critique and followup procedures**
- **Incident documentation**

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## KEY POINTS

**The explosive growth of chemicals in our society has led to**

- **An increase in the risk of hazardous materials incidents**
- **A Standard of Care defined by laws, regulations, and peer standards**
- **A need for local emergency response plans and SOP's**

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# *UNIT 3: PERSONAL SAFETY*

### *TERMINAL OBJECTIVE*

*The students will be able to value and practice personal safety during hazardous materials emergencies.*

### *ENABLING OBJECTIVES*

*The students will:*

1. *Recognize characteristics of nonemergency, normal emergency, and chemical emergency situations that affect personal safety.*

2. *Identify three categories of chemical controls that can be used in hazardous materials incidents.*

3. *List key psychological factors that can influence personal safety during emergency response operations.*

4. *Identify three primary components of personal safety.*

5. *Describe National Fire Protection Association (NFPA) and Occupational Safety and Health Administration (OSHA) safety-related standards.*

## INTRODUCTION

**Personal safety** is what this is all about. Specifically, the courses that make up the *Initial Response to Hazardous Materials Incidents* (IRHMI) program are designed to provide first responders with the basic knowledge and competencies needed to protect themselves from the hazards encountered during a hazardous materials response. By protecting themselves, responders will be able to help protect other emergency responders, the general public, and the community.

In order to protect yourself, you have to understand some basic concepts concerning:

- the nature of emergency response;
- the nature of the chemical hazard; and
- the psychology of responders like yourself.

This unit discusses these concepts and describes how your knowledge, awareness, and attitude can affect personal safety. The unit concludes with a discussion of safety standards.

## THE NATURE OF EMERGENCY RESPONSE

What makes an emergency response different from a day-to-day or routine situation? The answer is simple: **control**. During day-to-day situations, a relatively high degree of control exists over most, if not all, of the surroundings.

This is especially true with regard to chemicals. Many chemicals in routine use are extremely hazardous substances in terms of toxicity, reactivity, and flammability. Yet millions of people work with or around these products all the time. The only way that this is possible is through the use of controls.

### Controls

Controls fall into three primary categories:

1. Physical.

2. Environmental.

3. Procedural.

### Physical Controls

Physical controls are designed to keep a chemical in a given location and under the specific conditions required. Normally, physical controls involve **containers and containment systems**.

### Environmental Controls

Environmental controls are designed to detect, eliminate, or minimize the accumulation of chemicals in the environment. One of the best examples of this type of control is the use of ventilation and scrubbers to minimize the concentration of vapors in the work atmosphere. Other examples are containment ponds, tanks, and liquid separators.

### Procedural Controls

Procedural controls are used to protect people from possible exposures or dangerous reactions. Specifically, procedural controls are actions that people take to protect themselves from chemicals. Procedures include the wearing of protective equipment (respirators, chemical aprons, gloves, etc.) or following specific steps in the actual handling of a chemical.

In many situations, complex and interdependent control **systems** involving many different individual controls are used. Often, the more dangerous the chemical, the more complex the control system. These controls are what allow our society to produce, transport, use, and dispose of vast quantities of chemicals with little or no negative effects.

## Chemical Emergencies

As long as the appropriate controls are in place and functioning properly, things are just fine. However, when one or more controls are lost, for whatever reason, there is a problem. This problem can be referred to as an incident.

For our purposes, an incident is any situation in which a product (chemical) escapes or threatens to escape its container. Not all such incidents are emergencies. If the situation can be brought under control readily and easily by those in the immediate area, with no potential health hazard, there is no emergency (OSHA 29 CFR Part 1910.120). By far the vast majority of chemical releases or potential releases fall into this category.

For example, a quart container of motor oil slips from a mechanic's hand while it is being poured into the oil fill. The can falls on the floor and spills onto the surface. This is an incident because product has escaped its intended location. Yet this is **not** an emergency. The mechanic can very readily, easily, and safely clean up the spill with a rag or absorbent clay.

However, certain incidents accelerate into emergencies of varying degree. In some cases, an incident starts when the first control fails, and an unfortunate series of events begins. Because many of the controls function as systems, **the loss of one control often creates a domino effect within the entire system**. If control cannot be regained in a relatively short period of time, the domino effect can be extensive; an emergency now exists.

In other instances, a simple change in the quantity or hazard of the product produces an entirely different situation. For example, consider the previous motor-oil spill scenario. This time, instead of a 1-quart spill inside the garage, the mechanic spills a 55-gallon drum of the same motor oil. There is so much oil that it flows from the garage out onto the ramp and parking area. In most locations, this would be considered a limited-scale emergency, not because it will necessarily hurt or kill people, but because it cannot be readily and easily handled by those in the immediate area. It is also a potential threat to the environment. Therefore, the spill may not be a critical emergency, but it must be managed according to the Standard of Care and standard operating procedures (SOP's).

Now, suppose that instead of motor oil, the mechanic spills a 55-gallon drum of antifreeze, containing ethylene glycol. At the curb is a storm sewer inlet. This is now not only an emergency, but potentially one with far-reaching implications. Ethylene glycol is toxic and water-soluble. By entering the storm sewer, the product could be transported to a body of water, where it could kill most aquatic life and spread over an even greater area.

The point is that when control is lost, a series of events starts to take place. Even subtle changes in the scenario can produce a major impact upon the magnitude and hazard of the incident. Each incident must be treated as a unique situation. Unfortunately, the old adage, "familiarity breeds contempt" is all too true. If emergency responders treat an emergency situation without the respect it deserves, they are asking for an injury or worse. If the enemy is underestimated, your defenses may be overwhelmed.

## The Nature of Chemical Incidents

Incidents involving chemicals can be nasty situations that provide no graphic clues about the true nature of the hazard. In other words, responders often totally underestimate the dangers involved. In many incidents, responders even have failed to identify that an unusual hazard exists. How many times has a fire engine driven through a chemical spill, a police officer lit a flare near a flammable liquid spill, or an unprotected medic rushed right up to a contaminated victim?

Such seemingly silly or minor lapses can be and have been **lethal**! Do not underestimate the potential hazard when chemicals are involved. When you ask the driver, "What is this stuff?" and receive the response, "It's like lime," **do not settle for that answer**. That is not what you asked or need to know. Sodium fluoride could be said by the uninformed to be like sodium chloride. Sodium chloride is table salt; sodium fluoride is a deadly poison.

## Psychology of Response

Besides understanding emergency situations and variables, it is crucial to understand some basics about emergency responders. During an emergency response, certain psychological occurrences take place within the mind of the responder. Needless to say, a wide range of possibilities exists depending on the individual, the amount of training and education, length of service, experience, and type of incident.

It may seem odd to have to make this statement, but **emergency scenes are dangerous and potentially lethal**! Why? Because of the lack of control. There is **no other job** that allows or requires its employees to work in an uncontrolled environment, but that is what emergency response is all about. If events were not to some degree out of control, emergency responders would not be necessary. It is vital to understand that the way a chemical is handled and its hazards are identified in the day-to-day setting may be totally **different** during an emergency. Because this simple fact often is ignored, many people have been and will be injured or killed needlessly. This includes emergency responders.

Although the range of psychological responses varies, responders generally share certain reactions. First, upon being dispatched, most individuals have a basic adrenaline rush: there is excitement. The more extraordinary (due to magnitude, type, etc.) the response, the more the adrenaline is likely to flow. On the other hand, the more ordinary and routine the response is for the individual, the less adrenaline is likely to flow. **Either case** can be extremely dangerous to responders if they do not realize what is happening.

At whichever end of the emotional spectrum the responder is found, emotion has the tendency to put the brain in neutral. The responder is not **thinking** but, rather, **reacting**. As a result, the responder is at the mercy of the emergency situation.

When responders perceive the incident to be highly unusual, dangerous, or emotionally charged, they often experience **tunnel vision**. Tunnel vision occurs when responders focus on one aspect of the situation and lose sight of the overall incident. On the other hand, if the responders perceive the incident to be routine, they may go on **autopilot**. In either case, they become oblivious to their surroundings and thus are at the mercy of the incident.

Laziness can figure prominently in both situations. This trait is found in responders who have not been appropriately trained or who have been allowed to settle into a pattern. Whatever the reason, **laziness can be just as deadly as emotion**.

## THE COMPONENTS OF SAFETY

To ensure safety in emergency response situations, both **organizational** and **personal** factors must be addressed. The major components of safety, summarized in the table below, are discussed in the following sections.

| COMPONENTS OF SAFETY | |
|---|---|
| **Organizational** | **Personal** |
| Discipline<br>Command<br>Management | Knowledge<br>Awareness<br>Attitude |

### Organizational Components of Safety

The nature of emergency response suggests that some lack of control must always be assumed in the work environment. Key factors that emergency response organizations must address to maximize control (and thus safety) include discipline, command, and management.

**Discipline** must be maintained by all personnel in order to gain procedural control essential to safety. In particular, "freelancing" by individuals--"doing your own thing" at an emergency incident--must be avoided. Ways in which organizations can maintain discipline include training and education, development of comprehensive SOP's, and assignment of a Safety Officer at every incident.

**Command** structures (chain of command) and procedures must be defined clearly to ensure that all personnel understand their roles and responsibilities. This requirement helps ensure the integrity of work crews and the accountability of individual responders.

**Management** by officers or team leaders must be adequate to evaluate the operation continually and to identify potential safety problems for the members. If an assignment is questionable due to safety considerations, the IC and/or Safety Officer must be consulted.

## Personal Components of Safety

In order to operate safely during any situation, responders need three personal attributes of safety:

1. Knowledge.

2. Awareness.

3. Attitude.

**Knowledge** comes from training, education, and experience. Responders need to know specifically how to do their jobs. This means an indepth understanding of the SOP's of the agency. They must be intimately familiar with what they are expected to do, how they are expected to do it, and how to use the equipment needed for the job. **Knowledge is essential**.

**Awareness** is closely tied to knowledge and to other cognitive skills. Responders must be aware of exactly what is occurring at the incident scene and be able to extrapolate how that may affect them and others. They must be aware of the potential dangers associated with specific types of situations, even when those dangers are not readily apparent.

**Attitude** is the psychological approach you bring to the incident. A responder needs to have an appropriate attitude about emergency response--not an attitude problem. This attitude must reflect the fact that the potential hazards associated with a given situation are not always obvious. As a result, responders **must** follow their SOP's, even when they seem to be time-consuming or a total pain. Do not allow laziness to enter the picture, because the incident can deteriorate in the wink of an eye. **Those changes can and do kill!**

Knowledge and awareness, combined with an appropriate attitude, are the bridge to personal safety. Attitude is the key--you will not gain knowledge or awareness without the proper attitude. Developing a good attitude is up to you! It is personal. You are the only one who can do anything about it. Emergency response is your job! Safety is your job! Having the right **attitude backed up with knowledge and awareness is your responsibility**.

# Activity 3.1

# Personal Safety at Chemical Incidents

## Purpose

To help you start to view incidents with a critical eye toward personal safety.

## Directions

1. You will be shown three brief videotape scenarios that depict the actions of response personnel during a hazardous materials incident. Working in small groups, identify specific personal and operational safety problems you observe in the scenarios.

2. After each videotape sequence, you will have approximately 5 minutes to discuss the incident response and to take notes on the attached worksheets. Be prepared to report your group's results to the class.

## Activity 3.1 (cont'd)

## Personal Safety at Chemical Incidents Worksheet

### Scenario 1: Fire Service

Determine if the following actions were performed in a safe fashion.

1. Recognition and identification.

   a. The potential presence of haz mats was identified. (yes/no)
   b. Appropriate methods for identifying the product were used. (yes/no)

   Comments: ______________________________________________
   ______________________________________________________
   ______________________________________________________

2. Isolation.

   a. Vehicle stopped at an appropriate location. (yes/no)
   b. Personnel appropriately denied entry to the scene. (yes/no)

   Comments: ______________________________________________
   ______________________________________________________
   ______________________________________________________

3. Notification.

   a. Appropriate agencies/authorities were notified. (yes/no)
   b. Additional information was provided to other responders. (yes/no)

   Comments: ______________________________________________
   ______________________________________________________
   ______________________________________________________

4. Protection.

   a. Personnel used appropriate protective equipment. (yes/no)
   b. Personnel stayed uphill/upwind. (yes/no)
   c. Personnel stayed out of visible product. (yes/no)

   Comments: ______________________________________________________
   ________________________________________________________________
   ________________________________________________________________

## Scenario 2: Law Enforcement

Determine if the following actions were performed in a safe fashion.

1. Recognition and identification.

   a. The potential presence of haz mats was identified. (yes/no)
   b. Appropriate methods for identifying the product were used. (yes/no)

   Comments: ______________________________________________________
   ________________________________________________________________
   ________________________________________________________________

2. Isolation.

   a. Vehicle stopped at an appropriate location. (yes/no)
   b. Personnel appropriately denied entry to the scene. (yes/no)

   Comments: ______________________________________________________
   ________________________________________________________________
   ________________________________________________________________

3. Notification.

   a. Appropriate agencies/authorities were notified. (yes/no)
   b. Additional information was provided to other responders. (yes/no)

   Comments: ______________________________________________________
   ________________________________________________________________
   ________________________________________________________________

4. Protection.

   a. Personnel used appropriate protective equipment. (yes/no)
   b. Personnel stayed uphill/upwind. (yes/no)
   c. Personnel stayed out of visible product. (yes/no)

   Comments: ______________________________________________________________

   ______________________________________________________________

   ______________________________________________________________

## Scenario 3: Emergency Medical Services

Determine if the following actions were performed in a safe fashion.

1. Recognition and identification.

   a. The potential presence of haz mats was identified. (yes/no)
   b. Appropriate methods for identifying the product were used. (yes/no)

   Comments: ______________________________________________________________

   ______________________________________________________________

   ______________________________________________________________

2. Isolation.

   a. Vehicle stopped at an appropriate location. (yes/no)
   b. Personnel appropriately denied entry to the scene. (yes/no)

   Comments: ______________________________________________________________

   ______________________________________________________________

   ______________________________________________________________

3. Notification.

   a. Appropriate agencies/authorities were notified. (yes/no)
   b. Additional information was provided to other responders. (yes/no)

   Comments: ______________________________________________________________

   ______________________________________________________________

   ______________________________________________________________

4. Protection.

   a. Personnel used appropriate protective equipment. (yes/no)
   b. Personnel stayed uphill/upwind. (yes/no)
   c. Personnel stayed out of visible product. (yes/no)

   Comments: ____________________________________________
   ______________________________________________________
   ______________________________________________________

## NATIONAL FIRE PROTECTION ASSOCIATION STANDARDS

All NFPA Standards essentially are safety standards. In Unit 2: Regulations and Standards we reviewed several standards that were specific to hazardous materials emergencies. We now briefly examine a series of standards that address generic safety aspects of operations and protective equipment.

NFPA 1500 *Standard on Fire Department Occupational Safety and Health Program.*

NFPA 1500, adopted in 1989 to help address the safety needs of the fire service, has broad application to all responders. Relevant topics include the development of written SOP's for incident command and other areas, the designation of a safety supervisor, safety considerations for all phases of department operations, physical fitness, baseline medical testing, medical monitoring, a system of supervision during operations, and so forth.

### NFPA 1970 Series

In the 1970 series, NFPA addresses the various protective equipment components for structural firefighting. These standards include

- NFPA 1971, *Standard on Protective Ensemble for Structural Fire Fighting*.
- NFPA 1972, *Standard on Helmets for Structural Fire Fighting.*
- NFPA 1973, *Standard on Gloves for Structural Fire Fighting.*
- NFPA 1974, *Standard on Protective Footwear for Structural Fire Fighting.*
- NFPA 1975, *Standard on Station/Work Uniforms for Fire Fighters.*

### NFPA 1980 series

The NFPA 1980 series addresses the precise safety equipment to be used in conjunction with the personal protective equipment (PPE) identified in the 1970 series. These standards include

- NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters.*

- NFPA 1982, *Standard on Personal Alert Safety Systems (PASS) for Fire Fighters.*

- NFPA 1983, *Standard on Fire Service Life Safety Rope and System Components.*

### NFPA 1990 Series

The NFPA 1990 series addresses minimum design and manufacturing specification for various types of chemical protective equipment (CPE). These standards include

- NFPA 1991, *Standard on Vapor-Protective Suits for Hazardous Chemical Emergencies.*

- NFPA 1992, *Standard on Liquid Splash-Protective Suits for Hazardous Chemical Emergencies.*

- NFPA 1994, *Standard on Protective Clothing for Chemical/ Biological Response to Terrorism Incidents*

In general, chemical protective clothing is not for use by first responders. More on Chemical protective equipment (CPE) and related training requirements is included in Unit 7: Personal Protective Equipment.

## OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION SAFETY-RELATED REGULATIONS

Various safety regulations have been developed by OSHA and other agencies. Specifically, in the context of hazardous substances and emergency response, two regulations must be identified. Both regulations are found in 29 CFR Part 1910, Subparts L and Z. (Remember, this regulation correlates to the EPA 40 CFR Part 311.)

29 CFR 1910 Subpart L, 1910.155 and 1910.156, **Fire Protection**, address specific requirements for the development, operation, and management of fire brigades. Subpart L addresses requirements that include minimum equipment, positive-pressure self-contained breathing apparatus (SCBA's), PPE, extinguishing agents, organizational operations, and training requirements.

29 CFR 1910 Subpart Z, 1910.1000 to 1910.1048 address toxic and hazardous substance exposure limits and protective measures. This section consists of a series of charts that list exposure limits and protective equipment requirements for specific chemicals. The subsequent sections describe specific actions, precautions, procedures, surveillance, etc., for employees exposed to the listed substances.

## SUMMARY

The key characteristic of emergency response situations that makes them different and dangerous is lack of control. Three types of chemical controls exist during routine operations: physical, environmental, and procedural. During emergency conditions, the primary method is procedural.

Inappropriate psychological responses during an emergency can get you killed. The organizational components of safety in a hazardous materials incident are discipline, command, and management. The personal components of safety are knowledge, awareness, and attitude.

Knowledge comes from training and experience. Awareness of the overall situation and specific hazards grows out of knowledge and experience. Attitude is the approach you take to the incident. There is no margin at an incident scene for laziness and lack of attention to procedures.

Information on safety procedures is based on NFPA standards and OSHA regulations. Remember: personal safety is **your** responsibility.

# APPENDIX

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**UNIT 3:**
**PERSONAL SAFETY**

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Slide 3-2

**TERMINAL OBJECTIVE**

**The students will be able to value and practice personal safety during hazardous materials emergencies.**

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**ENABLING OBJECTIVES**

**The students will:**

- **Recognize characteristics of nonemergency, normal emergency, and chemical emergency situations that affect personal safety.**
- **Identify three categories of chemical controls that can be used in hazardous materials incidents.**

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## ENABLING OBJECTIVES (cont'd)

- **List key psychological factors that can influence personal safety during emergency response operations.**
- **Identify three primary components of personal safety.**
- **Describe NFPA and OSHA safety-related standards.**

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## PERSONAL SAFETY AND EMERGENCY RESPONSE

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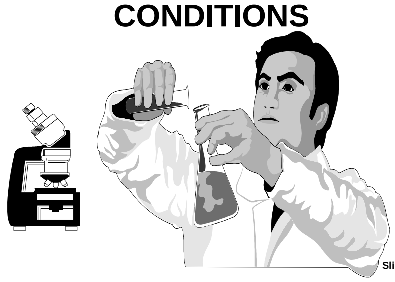
Slide 3-6

## "NORMAL" SETTING VERSUS EMERGENCY CONDITIONS



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## CHEMICAL CONTROLS

- **Physical**
- **Environmental**
- **Procedural**

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Slide 3-8

**Chemical emergencies require emphasis on procedural controls.**

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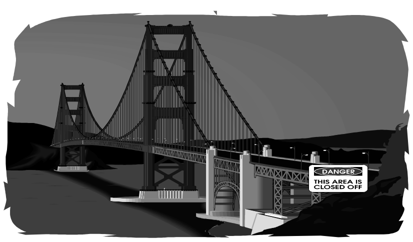
Slide 3-9

## CONTROLS IN CHEMICAL EMERGENCY RESPONSE SAFETY

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Slide 3-10

**Ignoring prescribed controls can be dangerous to your health!**

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Slide 3-11

**What happens psychologically during an emergency response?**

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Slide 3-12

**Inappropriate emotions, bad habits, or laziness during emergency response are deadly.**

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Slide 3-13

**Over 60 percent of fatalities in confined space rescues involve the would-be rescuer.**

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## KEYS TO SAFETY DURING EMERGENCY INCIDENTS

- **Discipline**
- **Command**
- **Management**

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## COMPONENTS OF SAFETY

- **Knowledge**
- **Awareness**
- **Attitude**

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TRAINING/EDUCATION
\+ EXPERIENCE
KNOWLEDGE

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Slide 3-17

AWARENESS IS THE ABILITY TO...

- **Consider the entire situation**
- **Recognize specific scene hazards**

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ATTITUDE

**The way individuals approach work.**

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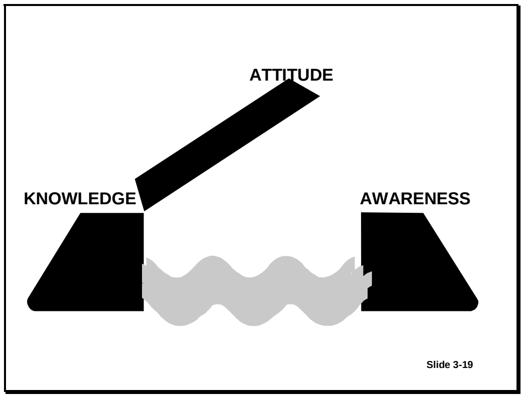
Slide 3-19

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**Activity 3.1**
**Personal Safety at Chemical Incidents**

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**SAFETY-RELATED STANDARDS AND REGULATIONS**

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## NFPA 1970 SERIES STRUCTURAL FIREFIGHTING

- **1971--Clothing**
- **1972--Helmets**
- **1973--Gloves**
- **1974--Footwear**
- **1975--Station Uniforms**

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## NFPA 1980 SERIES ADDITIONAL PROTECTIVE EQUIPMENT

- **1981, *Standard on Open Circuit Self-Contained Breathing Apparatus (SCBA) for Fire Fighters***
- **1982, *Standard on Personal Alert Safety Systems (PASS) for Fire Fighters***
- **1983, *Standard on Fire Service Life Safety Rope, and System Components***

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## NFPA 1990 SERIES CHEMICAL PROTECTIVE CLOTHING

- **1991, *Vapor Protection Suits***
- **1992, *Splash Protection Suits***
- **1994, *Chemical/Bio Terrorism Suits***

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## OSHA 29 CFR 1910

- **Subpart L**
- **Subpart Z**

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## 1910 SUBPART L

**(1910.155 and 1910.156)**
**Requirements For Fire Brigades**

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Slide 3-30

## 1910 SUBPART Z

**(1910.1000 to 1910.1048)**
**Toxic And Hazardous Substances**

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Slide 3-31

## KEY POINTS

- **Lack of control is dangerous.**
- **Physical, environmental, and procedural controls are needed.**
- **Chemical incidents require defensive procedures.**
- **Responders must monitor psychological reactions constantly.**
- **Knowledge, awareness, and attitude are essential.**

Slide 3-31

# *UNIT 4: TOXICOLOGY*

### *TERMINAL OBJECTIVE*

*The students will be able to apply principles and terminology of toxicology to ensure personal safety.*

### *ENABLING OBJECTIVES*

*The students will:*

1. *Define the terms toxicology, toxic substance, physical hazard, and health hazard.*

2. *Describe the concept of dose/response and define related terms (acute exposure, chronic exposure, subacute exposure, immediate response, and delayed response).*

3. *List the four methods of exposure and the primary target organs associated with each.*

4. *Discuss the concepts of exposure limits and the use of related measures (lethal dose to 50 percent ($LD_{50}$), lethal concentration to 50 percent ($LC_{50}$), threshold limit value (TLV), time-weighted average (TWA), permissible exposure limit (PEL), ceiling limit, and Immediately Dangerous to Life and Health (IDLH)).*

## INTRODUCTION

This unit deals with the basic principles of toxicology, the science of poisons. It discusses their measurement, effects on the human body, and the implications of contaminating yourself and others.

The purpose of learning about toxicology is to enable you, the first responder, to understand the risks associated with hazardous materials so that you can respond safely and appropriately.

## TOXICOLOGY

### What is Toxicology?

**Toxicology** is the science of poisons: their effects on the body, their detection in body fluids and tissues, and the various antidotes for their effects.

Hippocrates, the "Father of Medicine" (460 to 377 B.C.), discussed the toxic effects of drugs. He pointed out that the only difference between a toxic dose and a therapeutic dose was the quantity prescribed or taken by the patient.

As early as the 1500's, scientists started to make a connection between certain substances and health hazards. In the 1700's, scientists began to see the relationship between worker exposure to certain substances and health problems. At that time, though, health problems were considered an accepted risk of an occupation.

Despite its history, modern toxicology is considered a new science. It wasn't until the early 20th century that a genuine awareness of hazards related to occupational exposure to certain substances developed. This awareness evolved into the discipline of industrial hygiene.

#### Industrial Hygiene

We can't discuss toxicology without discussing industrial hygiene. **Industrial hygiene** is the science involved with the protection of workers' health through measurement of the work environment to determine if and where hazards exist. Scientists use various scientific methods and instrumental equipment to measure gases, vapors, and dusts in the air, extremes of heat or cold, noise, repetitive motion, and other work environment hazards.

Simply stated, industrial hygiene is the measurement of **"how much"** for **"what duration of time."** This translates to the **dose**. Information on dose is compared to information provided by toxicological studies to determine the effects of a substance on the body. Such analyses are better known as dose/response studies.

Industrial hygiene is the application of toxicology to the work environment. As such, the study of industrial hygiene has led to better understanding of approaches for safe and efficient response to chemical incidents. Thus toxicology and industrial hygiene form the foundation for the hazardous materials Standard of Care.

### The Occupational Safety and Health Act

In 1970, the Occupational Safety and Health Act established guidelines for worker safety. Until that time very few guidelines existed. The Act also established the Occupational Safety and Health Administration (OSHA), the Federal agency tasked with enforcing existing guidelines. Today, exposure limits exist for many known hazardous materials. These standards and guidelines protect workers from the hazards of overexposure.

## Types of Hazards

Generally speaking, chemical substances present two types of hazards:

- physical (mechanical) hazards; and
- health (biological) hazards.

**Physical hazards** act indirectly to cause harm. They include fires or explosions or other effects created by mechanical means. Gasoline is a good example. Classified as a flammable liquid, it is both a fire hazard and an explosive hazard. Even the vapors can be explosive.

**Health hazards** cause direct harm. If these products contact your body directly, they cause biological reactions, destroying tissue or making you ill. The response or adverse reaction may be **immediate** or **delayed**. Acids are good examples of immediate hazards. If an acid contacts skin, it immediately burns the area with which it comes in contact.

## Toxicity

Most people understand the word "toxic" to mean immediately life threatening. However, a toxic substance is any substance, which can cause a harmful effect once it reaches a susceptible target, such as the human body (eyes, lungs, skin, etc.) or other living organism by other than physical means. Toxicity is a health hazard. Toxic substances and criteria for classifying them are described in 29 Code of Federal Regulations (CFR) 1910.1200.

It is important to understand how toxicity is determined (or measured) for a particular substance. The toxicity of a substance depends on the **concentration of the substance**, **type of exposure**, **route of exposure**, **susceptible target organ, and other health-related variables**. In other words, how much, where, and for how long?

## Concentration

Concentration is the amount of one substance found in a given volume of another substance. Depending on the materials involved, there are many different ways of expressing concentration. Two of the most common are parts per million (ppm) and milligrams per kilogram (mg/kg).

### Parts Per Million

One method to measure concentration is in comparison with a given volume of air or liquid. In other words, you need one million parts of air or liquid and a certain number of parts of the substance.

### Milligrams Per Kilogram

Dose by ingestion is determined by comparing the unit weight of the poison (in milligrams) to unit body weight (in kilograms). For skin absorption, surface area would be measured.

## Type of Exposure

Exposure is defined as direct bodily contact with a substance. For purposes of this course, there are three types of exposures: acute, subacute, and chronic.

### Acute

Acute exposure is of short duration. Exposure to a substance with duration measured in seconds, minutes, or even hours may be considered acute. As applied to ingestion, it means a single dose.

### Subacute

Subacute exposures are a series of acute exposures that occur with an interval of time in between.

### Chronic

Chronic exposure means exposure of long duration or prolonged or repeated exposures that occur over hours, days, months, and years. For example: A 10-minute exposure to benzene, depending on concentration, probably would not cause cancer; however, 40 hours a week for 10 years is known to cause cancer at certain concentrations. This is a chronic exposure.

**Note**: Repeated exposures can result in **sensitization**. For example: Formaldehyde exposure can result in allergic reactions to future exposures.

## Routes of Exposure

Routes of exposure are the paths by which a substance enters the body. There are four primary routes of exposure: inhalation, ingestion, absorption/contact, and injection.

### Inhalation

Inhalation involves the breathing in of a substance, leading to direct contact with tissues in the respiratory tract (nose, throat, trachea, and lungs).

### Ingestion

Ingestion is the swallowing of a substance, resulting in contact with the digestive tract (mouth, throat, esophagus, stomach, and intestines).

### Absorption/Contact

Absorption/Contact involves direct contact with the skin and the destruction and/or passage of the material through the skin and eyes.

### Injection

Injection is the entry of a substance through a break in the skin.

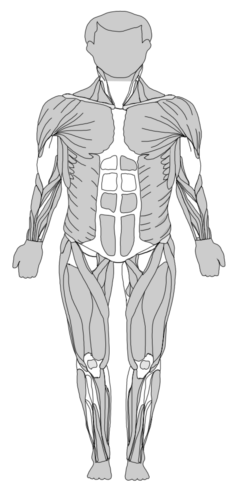
### Susceptible Target Organ

A target organ is an organ, such as lungs, skin, eyes, kidneys, liver, central nervous system, etc., upon which a substance has a toxic effect. OSHA has specific standards in 29 CFR 1910.1200 that describe target organs.

Do not confuse target organs and routes of exposure. For example, if you breathe a pesticide the route of exposure is inhalation. The material enters the lung, yet the target organ is the central nervous system. The following graphic shows the most important target organs for chemical exposure.

**Target Organs And Body Parts**

Nervous System
Skeleton & Marrow
Thyroid
Lungs
Heart
Blood
Veins
Liver
Kidneys
Intestines
Skin



### Other Health Variables

Other important factors in determining toxicity are body weight, age, physical condition, and gender of the potential victim. The very young and the very old tend to be weaker and more susceptible. Some substances, such as thalidomide, cause cancer or birth defects. Other substances affect male reproductive organs.

## Dose/Response

These five factors (concentration, type of exposure, route of exposure, susceptible target organ, and other health-related variables) affect dose/response, the relationship between the exposure and the biological effect that is produced.

### Dose

Dose is the concentration of a substance considered with regard to the length of time of the exposure. For example, if you follow the doctor's prescription for taking a medicine, you will receive a therapeutic dose. This is because the medicine will be in a safe concentration when absorbed by the body.

However, if you exceed the doctor's prescriptions--for example by taking a whole bottle of pills at once--the result could be a toxic dose. The concentration of the medicine will be much higher because a greater amount is absorbed in a limited period of time.

In both cases, the medicine was the same, but the response was very different, depending on the dose. Even seemingly nontoxic substances can have a negative health effect if the dose is too great (e.g., table salt). It is also important to remember that individuals can differ significantly in their response to various chemicals or doses.

### Immediate Versus Delayed Response

Some substances affect your body upon contact, or **immediately**; other substances take time to react with your body, sometimes as long as 24 to 72 hours (**delayed reaction**). Some substances do both.

An example of an immediate effect would be chlorine. It causes an immediate reaction: coughing, choking, or unconsciousness. It could also conceivably cause delayed reaction: edema--fluid buildup in the lungs.

Another example of delayed reaction would be the pesticide Malathion. It causes a delayed reaction because it is a systemic poison. It takes time to go through the bloodstream and to reach its target organ, the central nervous system. Some products (e.g., carcinogens) may have an effect many years down the road.

## Measures of Toxicity

In an attempt to establish a method for comparing the relative toxicity of substances, specific methods and terms have been developed. The following terms are widely used when discussing and comparing toxicity. Values for different products can be found in many reference books and in shipping papers, Material Safety Data Sheets (MSDS) forms, etc.

**MLD** (Median Lethal Dose) is a method developed by scientists to determine a substance's toxicity or to compare the toxicity of different substances. **MLD** is determined by exposing a group of test animals to a predetermined amount of a substance, e.g., 10 mg/kg. If 50 percent of the animals die, the median lethal dose would be determined.

**$LD_{50}$** (lethal dose to 50 percent of those exposed) is determined by **ingestion** or **skin absorption**.

**$LC_{50}$** (lethal concentration to 50 percent of those exposed) is determined by **inhalation**.

**Note**: The lower the number, the more toxic the dose/concentration.

- For $LD_{50}$, less than 200 ppm (mg/kg) is considered a poison.
- For $LC_{50}$, less than 150 ppm (mg/kg) is considered a poison.

A resource for this data is the National Institute of Occupational Safety and Health (NIOSH) book called, *Registry of Toxic Effects of Chemical Substances* (RTECS). The American Conference of Governmental Industrial Hygienists (ACGIH) also puts out in its pocket guide the testing information to determine exposure limits. The following definitions are taken from the publication, *2002 7th Edition Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*.

- Threshold Limit Value/Time Weighted Average **(TLV/TWA)** is the time-weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

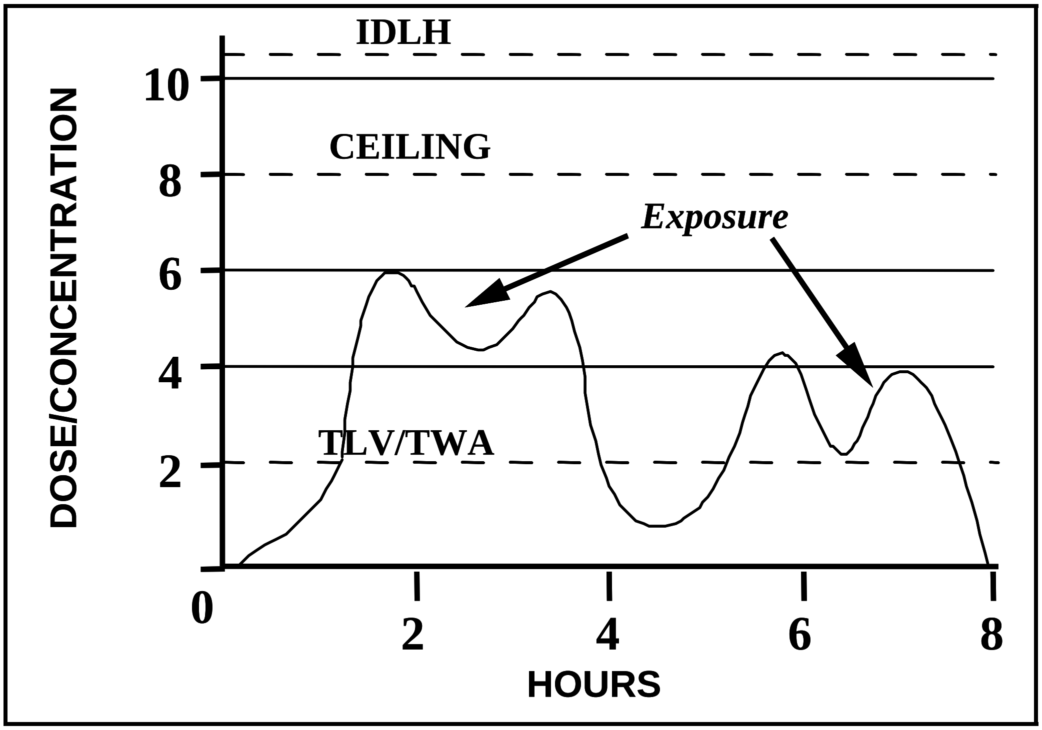
- Threshold Limit Value/Short-Term Exposure Limit **(TLV/STEL**) is the concentration to which workers can be exposed continuously for a short period of time without suffering from 1) irritation, 2) chronic or irreversible tissue damage, or 3) narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue, or materially reduce work efficiency, and provided that the daily TLV/TWA is not exceeded. It is not a separate independent exposure limit, rather it supplements the TWA limit where there are recognized acute effects from a substance whose toxic effects are primarily of a chronic nature. STEL's are recommended only where toxic effects have been reported from high short-term exposures in either humans or animals.

- A STEL is defined as a 15-minute TWA exposure which should not be exceeded at any time during a workday even if the 8-hour TWA is within the TLV/TWA. Exposures above the TLV/TWA up to the STEL should not be longer than 15 minutes and should not occur more than four times per day. There should be at least 60 minutes between successive exposures in this range. An averaging period other than 15 minutes may be recommended when this is warranted by observed biological effects.

- Threshold Limit Value-Ceiling **(TLV-C**) is the concentration that should not be exceeded during any part of the working exposure.

- Permissible Exposure Limit **(PEL)** is the amount of product that you may be exposed to without toxic effect over a given period of time.

- Immediately Dangerous to Life and Health **(IDLH)** is another measurement used by NIOSH. IDLH determines the highest concentration of a substance and the length of exposure before it is immediately dangerous.




Monitoring and Detection Equipment

By now you must be wondering how you are going to know if you are overexposed or under the TLV? Only trained personnel using specialized equipment over time can determine that. If a substance has a TLV, an $LD_{50}$, or an $LC_{50}$, wear your personal protective equipment (PPE).

Numerous detection devices are available on the market. Some specialize in detecting a group of substances, others detect one particular substance. Some give direct quantitative readouts with margins for error. Still others measure total volume of all substances. Most of these devices are expensive, complicated, have limited use and capability, and, most importantly, must be operated by professionals trained to use the instruments.

Unless you know how to interpret the data and apply them to some standard as they relate to health hazards, the data are of no use to you. This is not an area in which a first responder should be involved.

Avoiding Exposure

If you find yourself in an area that may be contaminated, avoid exposure--then you don't have to worry about the concentration.

- Avoid breathing the substance.

- Don't smoke, eat, chew, or put your hand in your mouth or near your face.

- Don't touch anything that may have come in contact with the substance.

- Remember, vapors, mists, and dusts can travel long distances, and leave residues behind!

If you do get contaminated, get decontaminated and get medical attention. If there is a source of information available, take it with you. Call a poison center or chemical regional center.

## Material Safety Data Sheets

An important source of toxicological information is the MSDS, Often these may be found with transportation shipping papers or at fixed facilities. Copies also may be available through the local fire department or Local Emergency Planning Committee (LEPC).

MSDS contain specific information mandated by OSHA 29 CFR 1910.1200 that can be very valuable to emergency responders. This information includes

- chemical and common names;
- physical and chemical properties;
- physical and health hazards;
- primary routes of exposure;
- exposure limits;
- safe handling precautions;
- emergency and first aid measures; and
- contact person/company.

# Activity 4.1

## Material Safety Data Sheets

### Purpose

To review Material Safety Data Sheets.

### Directions

1. Turn to the MSDS forms on the following page.

2. The instructor will start with the first MSDS and identify the various portions of the sheet. Two different MSDS forms are provided for your review. **Specifically review the toxicology data portion.**

3. Identify the following items from the second MSDS. Note that the level of detail, format, and usefulness of MSDS may vary significantly

   a. Material name: ____________________

   b. Synonyms: ____________________

   c. CAS number/s: ____________________

   d. PEL: ____________________

   e. TLV: ____________________

   f. Effects of exposure: ____________________

# MATERIAL SAFETY DATA SHEET

## SECTION 1. PRODUCT IDENTIFICATION

Manufacturer: CasChem Inc.
40 Avenue A
Bayonne, NJ 07002

Information and Emergency Phone during business hours:
201-858-7900
For Emergencies Call CHEMTREC: 800-424-9300

Trade Name: Vorite 1740
Chemical Name: Mixture
Synonyms: Mixture
CAS#: Mixture
Chemical Family: Urethane prepolymer
Product Number: 72366

## SECTION 2. HAZARDOUS COMPONENTS

| Components | CAS# | Weight % |
|---|---|---|
| Diphenylmethane diisocyanate (MDI) | 26447-40-5 | <20% |
| Polymethylene polyphenyl isocyanate | 9016-87-9 | <10% |

## SECTION 3. HEALTH HAZARD DATA

**Emergency Overview:**

Brown liquid with mild odor.

Can evolve irritating and/or sensitizing vapors when heated.

Hot liquid can react vigorously with water, generating $CO_2$.

**Exposure Limits:** Not established for this product. Use the exposure limits listed below for MDI.

For MDI:
OSHA PEL: 0.02 ppm Ceiling
ACGIH TLV: 0.005 ppm Time Weighted Average

NE = Not Established NA = Not Available

**Primary Routes of Entry:** Inhalation, eye contact, skin contact, and ingestion.

**Effects of Overexposure:**

Note: Airborne levels of MDI are not anticipated to exceed exposure limits under normal conditions of use unless material is heated or sprayed.

**Inhalation**:

Acute Exposure: Vapors or mist at concentrations above the exposure limits for MDI may irritate the mucous membranes in the respiratory tract causing runny nose, sore throat, coughing, chest discomfort, shortness of breath, and reduced lung function. May also cause vomiting and possibly fever. Individuals with preexisting, nonspecific bronchial hyperactivity may respond to concentrations below the TLV with similar symptoms as well as asthma attack. Exposure well above the TLV may lead to bronchitis, bronchial spasm and pulmonary edema (fluid in the lungs). These effects may be irreversible. Symptoms may occur up to several hours after exposure.

Chronic Exposure: As a result of previous repeated overexposures or exposure to a single large dose of isocyanate, susceptible individuals may develop MDI sensitization (chemical asthma) which will cause them to react to later exposure to isocyanates at levels well below the TLV. These symptoms, which can include chest tightness, wheezing, cough, shortness of breath, or asthma attack, could be immediate or delayed up to several hours after exposure. There are reports that once sensitized an individual can experience these symptoms upon exposure to dust, cold air or other irritants. This increased sensitivity can persist for weeks and in severe cases for several years. Overexposure to isocyanates has also been reported to cause lung damage, including decrease in lung function, which may be permanent. Sensitization can either be temporary or permanent.

**Skin Contact:**

May cause irritation with reddening, swelling, rash, scaling or blistering. Cured material is difficult to remove.

Some individuals may develop skin sensitization. Individuals who have developed a skin sensitization may develop these symptoms as a result of contact with very small amounts of liquid or following exposure to vapor.

**Eye Contact:**

May cause irritation, including excess redness and swelling of the conjunctiva.

**Swallowing:**

May result in irritation and possibly corrosive action in the mouth, stomach tissue and digestive tract. Based on animal studies, material has low oral toxicity.

## SECTION 4. FIRST AID MEASURES

Breathing: Remove victim to an area where no further exposure can occur. Administer oxygen or artificial respiration as needed. Get medical attention.

Skin Contact: Immediately remove contaminated clothing and shoes, and wash affected area with plenty of soap and water for at least 15 minutes. Use emergency shower if needed. Seek medical attention if irritation or other symptoms develop. Dispose of contaminated clothing or place in impervious containers and clean before reuse. Notify cleaning personnel.

Eye contact: Flush eyes with tepid water or saline solution for at least 15 minutes, holding eyelids open. Get immediate medical attention.

Swallowing: DO NOT INDUCE VOMITING. Give 1 to 2 cups of milk or water to drink. Never give anything by mouth if the victim is unconscious or having convulsions. Notify a physician immediately.

## SECTION 5. FIRE AND EXPLOSION DATA

NFPA Ratings: Health: 2 Fire: 1 Reactivity: 1

OSHA Flammability: III B

Flash Point: 425 F method: cc

Lower Explosive Limit: NE Upper Explosive Limit: NE

Auto Ignition Temperature: NE

Extinguishing Media: Use dry chemical, $CO_2$, or alcohol type foam applied by manufacturer's recommended techniques. Water spray may be used to cool adjacent containers.

Special Firefighting Procedures: Wear positive pressure SCBA when fighting fires involving this material. Wear NFPA approved full turnout gear. Keep personnel removed from and upwind of fire. Cool adjacent containers with water spray. CAUTION: The reaction of water and hot MDI may be vigorous.

Unusual Fire and Explosion Hazards: MDI vapors as well as CO, $CO_2$, oxides of nitrogen and traces of HCN may be released by thermal decomposition or burning.

## SECTION 6. STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Small Spill: Absorb the spilled material with sand or other oil absorbent material and place in containers for proper disposal. Do not seal containers. Transport to a well ventilated area and treat with a neutralizing solution consisting of a mixture of water and 3-8% concentrated ammonium hydroxide or 5-10% sodium carbonate. Add about 10 parts neutralizing solution per part of material spilled material and mix thoroughly. Allow to stand for 48 hours letting evolved $CO_2$ escape.

Large Spill: For transportation spill call CHEMTREC: 800-424-9300. Do not touch or walk through the spilled material. Stop leak if you can do it without risk. Evacuate and ventilate the spill area. Keep material out of waterways and sewers. Build dikes to contain flow as necessary. Large quantities may be pumped into closed, but not sealed, containers for disposal.

Waste Disposal Method: Dispose of in accordance with all federal, state, and local regulations.

## SECTION 7. PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

Keep away form heat and open flame. Use only with adequate ventilation. Avoid breathing vapors. Prevent contact with skin and eyes. Keep container closed when not in use. Prevent contamination with water or other incompatible materials.

Page 5 of 7 Vorite 1740 Prepared: 7/18/91
Revised:

## SECTION 8. PERSONAL PROTECTION/EXPOSURE CONTROLS

Respiratory Protection: Avoid breathing vapor and/or mist. Use NIOSH/MSHA approved respirator when airborne exposure may exceed exposure limits. A supplied air type respirator must be worn when exposure to MDI exceeds exposure limits. Consult respirator manufacturer to determine the appropriate type of equipment for a given application. Observe respirator use limitations specified by NIOSH or the respirator manufacturer. Respiratory protection programs must comply with 29 CFR 1910.134.

Engineering Controls: Use engineering controls such as process enclosure and/or local exhaust ventilation to keep exposures below exposure limits.

Protective Gloves: Butyl Rubber

Eye Protection: Wear goggles and faceshield as needed to prevent eye contact.

Other Protective Equipment: Impervious aprons, sleevelets, overalls or boots as needed to prevent contact with skin. Provide emergency eyewash and shower.

## SECTION 9. PHYSICAL DATA

Appearance: Brown oily liquid
Odor: Mild
Boiling Point: NE
Volatile % by wght: NE
Specific Gravity: 1.0
Bulk Density (lb./gal.): 8.3
Vapor Density (relative to air): Heavier
Vapor Pressure (mm HG): NE
Evaporation rate (relative to n-Butyl Acetate): NE
pH: NA
Solubility in $H_2O$: Insoluble
Viscosity: NE
Freezing Point: NE

## SECTION 10. REACTIVITY DATA

Unstable?: NO
Prone to Hazardous Polymerization?: May occur in contact with strong bases or water, or at temperatures above 374F (175C).
Strong Oxidizer?: no

Incompatibility: Water, acids, bases, alcohols, alkaline materials, metal compounds, surface active materials[1], and strong oxidizers.

Conditions to Avoid: Avoid contact with incompatible materials. Avoid water as it reacts to form heat and $CO_2$. The effect of heat and $CO_2$ may produce enough pressure to rupture a closed container.

Hazardous Decomposition Products: MDI vapors as well as CO, $CO_2$, oxides of nitrogen and HCN may be released by thermal decomposition or burning.

## SECTION 11. REGULATORY INFORMATION

Transportation:

DOT: Not regulated as a hazardous material

IMO:
Proper Shipping Name: Mixture of Diphenylmethane-4, 4'-diisocyanate
Hazard Class: 6.1
UN No.: 2489
IMO Labels: 6.1

IATA:
Proper Shipping Name: Mixture of Diphenylmethane-4, 4'-diisocyanate
Hazard Class: 6.1
UN No.: 2489
IATA Labels: Keep away from food

Environmental:
Are all components TSCA Listed? Yes
SARA Title III Hazard Categories and Lists:
Product Hazard Classes:
Chronic Health: Yes
Acute Health: Yes
Fire Hazard: No
Pressure Hazard: No

Reactivity Hazard: No

Lists (also see comments below):

Extremely Hazardous Substance?: No
CERCLA Hazardous Substance?: No
CERCLA Reportable Quantity: NA
Section 313 Toxic Chemical?: Yes, contains the following substance subject to reporting: Aromatic Isocyanate, no greater than 50%

California Proposition 65 Ingredients:

| Ingredient | CAS# |
|---|---|
| None | |

## SECTION 12. HAZARD RATING SYSTEMS

HMIS Hazard Ratings:

Health: 2
Fire: 0
Reactivity: 1

This information is furnished without warranty, expressed or implied, except that it is accurate to the best knowledge of CasChem Inc. The data on this sheet relates only to the specific material designated herein. CasChem Inc. assumes no legal responsibility for use or reliance upon these data.

# MATERIAL SAFETY DATA SHEET

PAGE 1

No. 505

## SECTION I PRODUCT IDENTIFICATION & EMERGENCY INFORMATION

**PRODUCT NAME**
Acetone

**CHEMICAL NAME**
2-Propanone CAS 67-64-1

**CHEMICAL FAMILY**
Ketone

**PRODUCT APPEARANCE**
Clear colorless liquid with a characteristic pungent odor.

**EMERGENCY TELEPONE NUMBERS:**

## SECTION II HAZARDOUS COMPONENTS OF MIXTURES

The precise composition of this mixture is proprietary information. A more complete disclosure will be provided to a physician or nurse in the event of a medical emergency. the following components are defined hazardous in accordance with 29cfr1910.1200:

Not applicable for this product.

For additional information see Section III.

## SECTION III HEALTH INFORMATION AND PROTECTION

**FIRST AID & NATURE OF HAZARD**

**EYE CONTACT:**

Immediately flush eyes with large amounts of water for at least 15 minutes. Get prompt medical attention.
Irritating, and may injure eye tissue if not removed promptly.

**INHALATION:**

Using proper respiratory protection, immediately remove the affected victim from exposure. Administer artificial respiration if breathing is stopped. Keep at rest. Call for prompt medical attention. High vapor concentrations are irritating to the eyes and the respiratory tract. May cause headaches and dizziness, are anesthetic and may have other central nervous system effects.

**SKIN CONTACT:**

Flush with large amounts of water; use soap if available.
Remove grossly contaminated clothing, including shoes, and launder before reuse.
Frequent or prolonged contact may irritate and cause dermatitis.
Low order of toxicity.

**INGESTION:**

First aid is normally not required.
Minimal toxicity.

**ACUTE TOXICITY DATA IS AVAILABLE UPON REQUEST**

**PERMISSIBLE EXPSOURE LIMIT: OSHA REQUIRES (29CFR 1910.1000):**
A TWA of 1000 ppm (2400 mg/m3) for Acetone:

**THRESHOLD EXPOSURE LIMIT: ACGIH RECOMMENDS:**
A TWA of 750 ppm (1780 mg/m3), and a STEL of 1000 ppm (2375 mg/m3) for Acetone.

# MATERIAL SAFETY DATA SHEET

PAGE 2

**PRODUCT NAME:** Acetone No. 505

**PERSONAL PROTECTION**

Where contact may occur, wear safety glasses with side shields. For open systems where contact is likely, wear long sleeves, chemical resistant gloves, chemical safety goggles and a face shield.

Where concentrations in air may exceed the limits given in this Section and engineering, work practice or other means of exposure reduction are not adequate. NIOSH/MSHA approved respirators may be necessary to prevent overexposure by inhalation.

**VENTILATION**

The use of mechanical dilution ventilation is recommended whenever this product is used in a confined space, is heated above ambient temperatures, or is agitated.

Use explosion-proof ventilation equipment.

## SECTION IV FIRE & EXPLOSION HAZARD

**FLASHPOINT DEG. F:** **O METHOD:** TOC

**FLAMMABLE LIMITS-LEL:** 2.6 **UEL:** 13.0 **NOTE:** 25 DEG. C (77 DEG. F)

**AUTOIGNITION TEMPERATURE DEG. F:** 1000

**GENERAL HAZARD**

Extremely Flammable, material will readily ignite at ambient temperatures.

Flammable Liquid, can release vapors that form flammable mixtures at temperatures at or above the flashpoint.

Empty product containers may contain product residue. Do not pressurize, cut, heat, weld or expose containers to flame or other sources of ignition.

**FIRE FIGHTING**

Use water spray to cool fire exposed surfaces and to protect personnel.

Shut off "fuel" to fire. FI a leak or spill has not ignited, use water spray to disperse the vapors.

Either allow fire to burn under controlled conditions or extinguish with alcohol type foam and dry chemical. Try to cover liquid spills with foam.

**HAZARDOUS COMBUSTION PRODUCTS**

No unusual

## SECTION V SPILL CONTROL PROCEDURES

**LAND SPILL**

Eliminate sources of ignition. Prevent additional discharge of material, if possible to do so without hazard. For small spills implement cleanup procedures; for large spills implement cleanup procedures and, if in public area, keep public away and advise authorities. Also, if this product is an EPA hazardous substance (See Section X, Page 4) notify the U.S. EPA if appropriate.

Prevent liquid from entering sewers, watercourses, or low areas. Contain spilled liquid with sand or earth. Do not use combustible materials such as sawdust.

Recover by pumping (use an explosion proof or hand pump) or with a suitable absorbent.

Consult an expert on disposal of recovered material and ensure conformity to local disposal regulations.

# MATERIAL SAFETY DATA SHEET



**PRODUCT NAME:** Acetone

No. 505

**WATER SPILL**

Consult an expert on disposal of recovered material and ensure conformity to local disposal regulations.

## SECTION VI NOTES

**CAS NUMBER:** 000067641

# MATERIAL SAFETY DATA SHEET

PAGE 4

**PRODUCT NAME:** Acetone

No. 505

## SECTION VII TYPICAL PHYSICAL & CHEMICAL PROPERTIES

| | |
|---|---|
| **SP. GRAVITY REF. TEMP. °F**<br>0.79 @ 68.0/68.0 | **VAPOR PRESSURE MMHG at °F**<br>56.256 @ 25<br>213.021 @ 75 |
| **SOLUBILITY IN WATER, WTL. at ºF**<br>100 @ 68 | **VISCOSITY OF LIQUID. EST at ºF**<br>0.4 @ 68 |
| **SP. GRAVITY OF VAPOR, at 1 ATM AIR+1**<br>2.0 | **FREEZING MELTING POINT/RANGE, ºF**<br>-137.92 |
| **EVAPORATION RATE, n-BU ACETATE+1**<br>11.6 | **BOILING POINT/RANGE ºF**<br>132.98 |

## SECTION VIII REACTIVITY DATA

| | |
|---|---|
| **STABILITY**<br>Stable | **HAZARDOUS POLYMERIZATION OCCUR?**<br>will not occur |
| **CONDITIONS TO AVOID INSTABILITY**<br>Not Applicable | **CONDITIONS TO AVOID HAZARDOUS POLYMERIZATION**<br>Not Applicable |

**MATERIALS AND CONDITIONS TO AVOID INCOMPATIBLITY**

Caustics, amines, alkanolamines, aldenydes, ammonia, strong oxidizing agents, and chlorinated compounds.

**HAZARDOUS DECOMPOSITION PRODUCTS**

None

## SECTION IX TRANSPORT & STORAGE

**ELECTROSTATIC ACCUMULATION HAZARD**

No, but use proper grounding procedure

| | |
|---|---|
| **STORAGE TEMPERATURE, ºF**<br>Ambient | **LOADING/UNLOADING TEMPERATURE, ºF**<br>Ambient |
| **STORAGE/TRANSPORT PRESSURE, MMHG**<br>Atmospheric | **VISCOSITY AT LOADING/UNLOADING TEMPERATURE, CST**<br>0.4 @ 68 |

## SECTION X HAZARD CLASSIFICATION

| | |
|---|---|
| **U.S. DOT CLASSIFICATION**<br>Not available | **EPA HAZARDOUS SUBSTANCE** **AMOUNT LBS.**<br>Not available |

**OTHER**

Not available

| REFERENCE NUMBER | DATE PREPARED | SUPERCEDES ISSUE DATE |
|---|---|---|
| HDHA-C-00001 | AUGUST 21, 1985 | AUGUST 21, 1985 |

**FOR ADDITIONAL PRODUCT INFORMATION CONTACT YOUR TECHNICAL SALES REPRESENTATIVE**

**FOR ADDITIONAL HEALTH/SAFETY INFORMATION CALL**

## Definitions of Common Terms in MSDS Forms

**boiling point**--temperature at which a liquid turns into a gas.

**concentration**--the amount of a substance mixed with another substance.

**condensation/boiling point**--temperature at which the gas and liquid states of a substance co-exist.

**condensation point**--temperature at which a gas turns into a liquid.

**cryogenic liquid**--a gas liquefied by cooling it to its boiling point. The gas remains liquid due to low temperature.

**expansion ratio**--ratio of gas volume compared to liquid volume.

**flammable range (explosive limits)**--the percentage of vapor in air that is able to burn.

**flashpoint**--minimum temperature to which a substance must be heated in order to produce enough vapor to allow for ignition, if an ignition source is present.

**freezing point**--temperature at which a liquid turns into a solid.

**gas**--matter that has a volume controlled by pressure and no specific shape.

**ignition temperature**--(auto-ignition temperature)--minimum temperature to which a substance must be heated to cause combustion (rapid oxidation).

**liquefied compressed gas**--a gas that has been liquefied by the application of pressure. The gas remains liquid due to pressure within the container.

**liquid**--matter that has a specific volume, forms to the shape of its container, or flows over a surface.

**lower explosive limit (LEL)**--minimum percentage of fuel in air that will burn.

**melting/freezing point**--the temperature at which the solid and liquid state of a material will co-exist.

**melting point**--temperature at which a solid turns into a liquid.

**molten solids**--solids that have been liquefied by heating. The solid remains liquid by heating or insulation of the container.

**physical states**--solid, liquid, gas.

**pyrophoric**--materials that ignite without an ignition source.

**refrigerated liquid**--DOT terminology for cryogenic liquids.

**solid**--matter with a specific shape, volume, and in a relatively rigid form.

**upper explosive limit (UEL)**--maximum percentage of fuel in air that will burn.

**vapor**--the gaseous state of substance produced by the liquid state.

**vapor density**--density of vapor compared to density of air; vapor density of air is 1. Vapor density less than 1 indicates vapor is lighter than air; vapor density greater than 1 indicates vapor is heavier than air.

**vapor pressure**--the pressure produced by the formation of vapor.

**water reactivity**--the ability of a substance to react with water or moist air.

**water solubility**--substance that will dissolve in water, sometimes referred to as miscibility.

# APPENDIX

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**TOXICOLOGY**

Slide 4-1

Slide 4-2

**TERMINAL OBJECTIVE**

**The students will be able to apply the principles and terminology of toxicology to ensure personal safety.**

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Slide 4-3

**ENABLING OBJECTIVES**

**The students will:**

1. **Define the terms toxicology, toxic substance, physical hazard, and health hazard.**
2. **Describe the concept of dose/response and define related terms (acute exposure, chronic exposure, subacute exposure, immediate response, and delayed response).**

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Slide 4-4

## ENABLING OBJECTIVES (cont'd)

3. **List the four methods of exposure and the primary target organs associated with each.**
4. **Discuss the concepts of exposure limits and the use of related measures: ($LD_{50}$, $LC_{50}$, TLV, TWA, PEL, ceiling limit, and IDLEH).**

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Slide 4-5

## TOXICOLOGY (Study of Poisons)

- **Effects on the body**
- **Methods of detection**
- **Antidotes**

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Slide 4-6

## IMPACTS OF TOXICOLOGY

- **Responsible for major aspects of Standard of Care.**
- **Primary consideration is the safety of responders and the public.**
- **It has helped identify appropriate personal protective equipment (PPE).**
- **Basis for decontamination.**

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Slide 4-7

## HISTORY OF TOXICOLOGY

- **Interest in chemical effects started a long time ago.**
- **The formal science of toxicology is relatively new.**

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## HISTORY OF TOXICOLOGY (cont'd)

- **Interest has been spurred by employee health and safety concerns.**
- **Led to studies in industrial hygiene.**

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Slide 4-9

## INDUSTRIAL HYGIENE

- **The science of protecting workers' health.**
- **Effected through the measurement and control of the work environment.**
- **Results are correlated with toxicological findings.**

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Slide 4-10

## PRINCIPLES OF INDUSTRIAL HYGIENE ARE THE BASIS FOR...

- **The Standard of Care**
- **Responder safety**
- **Protection of the public**
- **Planning and training requirements**

Slide 4-10

Slide 4-11

## FOCUS ON WORKER SAFETY BY 1970

- **Led to the Occupational Safety and Health Act**
- **Led to the formation of the Federal Occupational Safety and Health Administration (OSHA)**

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Slide 4-12

## TWO TYPES OF HAZARDS

- **Physical (mechanical)**
- **Health (biological)**

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## PHYSICAL HAZARDS

**Result of fire, explosion, impact, etc.**


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Slide 4-14

## HEALTH HAZARDS ACT DIRECTLY UPON THE BODY TO CAUSE...

- **Biological reactions**
- **Tissue destruction (including skin)**

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## TOXIC SUBSTANCES

- **Cause harmful effects**
- **Must contact susceptible living target organs**
- **Act via chemical means**

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## TOXICITY INVOLVES…

- **Concentration**
- **Type of exposure**
- **Route of exposure**
- **Susceptible target organ**
- **Health variables**

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## CONCENTRATION

**The specific amount of a substance in a given volume of another substance.**

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## METHODS OF EXPRESSING CONCENTRATION

- **Percentages**
- **Parts per million/billion**
- **Milligrams per cubic meter, foot, kilogram, and cubic liter**

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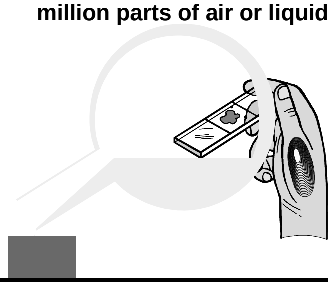
## PARTS PER MILLION (ppm)

**Parts of contaminant compared to one million parts of air or liquid.**



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## MILLIGRAMS PER KILOGRAM (mg/kg)

- **The amount of a contaminant expressed in milligrams (1/1,000 of a gram)**
- **Per kilogram (1,000 grams) of body weight of an animal**

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## EXPOSURE

**Direct bodily contact with a substance.**


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## TYPES OF EXPOSURE

- **Acute (single exposure)**
- **Subacute (intervals of time between acute exposures)**
- **Chronic (repetitive exposures)**

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## FOUR ROUTES OF EXPOSURE

- **Inhalation--respiratory tract**
- **Ingestion--digestive tract**
- **Absorption/Contact--skin and eyes**
- **Injection--break in skin**

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## SUSCEPTIBLE TARGET ORGAN

**The specific organ affected by a substance**

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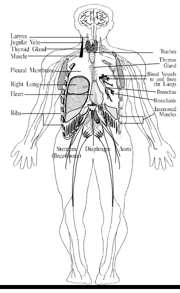
## TARGET ORGANS AND PARTS

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Slide 4-26

## VARIABLES OF SUSCEPTIBILITY

- **Age**
- **Gender (sex)**
- **Physical condition**

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Slide 4-27

## DOSE/RESPONSE

- **Dose--concentration and duration of an exposure**
- **Response--biological effect of the dose**

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## TYPES OF RESPONSES

- **Immediate**
- **Delayed**

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## COMPARING RELATIVE TOXICITY

- **$LD_{50}$--lethal dose to 50 percent of those exposed by ingestion or absorption**
- **$LC_{50}$--lethal concentration to 50 percent of those exposed by inhalation**

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## TOXICOLOGICAL TERMS

- **PEL--permissible exposure limit**
- **TLV/TWA--threshold limit value/time-weighted average**

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**TOXICOLOGICAL TERMS (cont'd)**

- **Ceiling--Maximum exposure concentration allowed**
- **IDLH--Immediately Dangerous to Life and Health**

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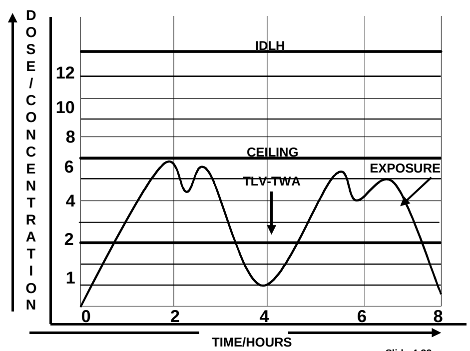


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Slide 4-33

**EXPOSURE PREVENTION**

**DO NOT inhale, ingest, or touch anything that comes in contact with hazardous substances.**

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Slide 4-34

**Toxicology data are available from the Material Safety Data Sheets (MSDS).**

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Slide 4-35

## MATERIAL SAFETY DATA SHEETS

- **Chemical and common names**
- **Physical and chemical properties**
- **Physical hazards**
- **Health hazards**

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## MATERIAL SAFETY DATA SHEETS (cont'd)

- **Primary routes of exposure**
- **Exposure limits**
- **Safe handling procedures**
- **Emergency and first aid measures**
- **Contact person or company**

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**Activity 4.1**
**Material Safety Data Sheets**

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**SUMMARY**

- **Toxicology is the science of poisons and a basis for the Standard of Care.**
- **Hazard types are physical and health.**
- **The components of toxicity are concentration, type of exposure, route of exposure, susceptible target organ, and other health variables.**
- **Dose/Response is the relationship between exposure and effect.**
- **Measures of toxicity are $LD_{50}$, $LC_{50}$, TLV/TWA, PEL, Ceiling limit, and IDLH.**

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# *UNIT 5: INTRODUCTION TO RECOGNITION AND IDENTIFICATION*

### *TERMINAL OBJECTIVE*

*The students will be able to identify the hazard class and, if possible, the product name of hazardous materials found at an emergency scene.*

### *ENABLING OBJECTIVES*

*The students will:*

1. *List six clues for hazardous materials recognition and identification.*

2. *Recognize the appropriate United Nations/Department of Transportation (UN/DOT) hazard class of various substances.*

3. *Identify the product name using UN identification numbers.*

4. *From a silhouette, recognize the general type of container, product, and hazards that may be present.*

5. *Demonstrate the use and interpretation of the DOT* North American Emergency Response Guidebook *(NAERG).*

## INTRODUCTION

This unit provides basic information on simple techniques for "hazardous materials self-defense." These techniques emphasize the recognition of situations, locations, and containers that indicate a high probability for the presence of hazardous materials. Specific types of containers and their shapes will be identified, as well as the types of products that they may contain.

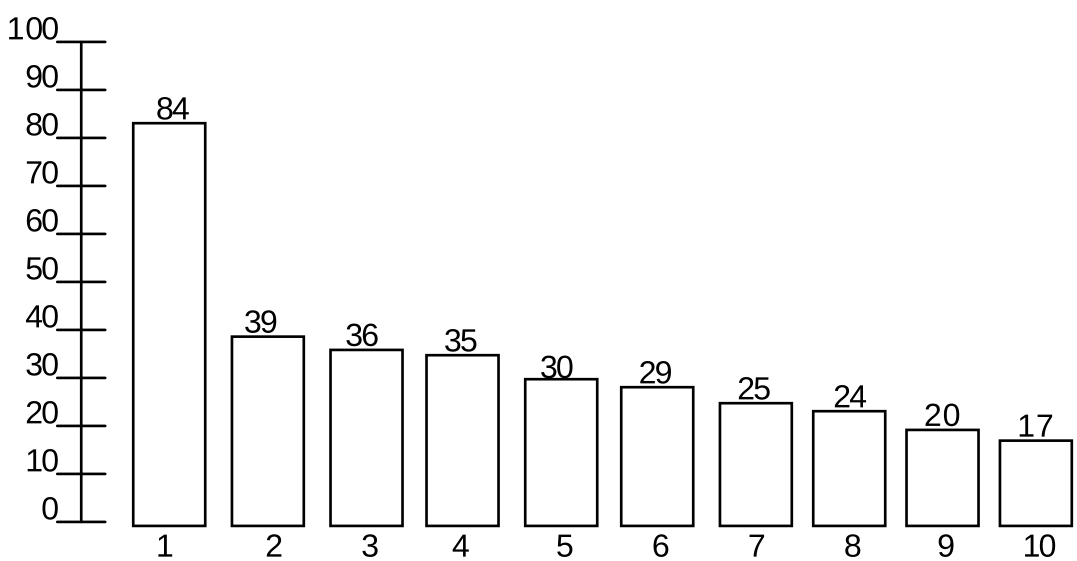
This unit also describes techniques for identifying specific substances by using shipping papers, identification numbers, markings, material safety data sheets (MSDS), and the DOT *North American Emergency Response Guidebook* (NAERG).

### A Perspective on the Top 10 Chemicals

In order to prepare for a hazardous materials emergency, you may want to know, "Which chemicals are the most common?"

The top 10 chemicals are listed below with the approximate amount produced per year. Not included are gasoline and hydrocarbon fuels.

**Chemicals Produced Per Year**




1. Sulfuric acid--84 Billion pounds
2. Lime--39 Billion pounds
3. Ammonia--36 Billion pounds
4. Oxygen--35 Billion pounds
5. Nitrogen--30 Billion pounds
6. Ethylene--29 Billion pounds
7. Sodium hydroxide--25 Billion pounds
8. Chlorine--24 Billion pounds
9. Phosphoric acid--20 Billion pounds
10. Nitric acid--17 Billion pounds

## THE IMPORTANCE OF RECOGNITION AND IDENTIFICATION

Recognition and Identification (R&I) programs often are viewed as rather tedious and boring. Face it, there is nothing flashy or enthralling about placards and labels.

Unfortunately, as a result, responders have a tendency to downplay the importance of the information. **This is a potentially lethal mistake**! R&I clues are **your first line of defense** against hazardous materials and their potential effects on you, the emergency responder.

If you do not recognize that hazardous materials are or may be involved in the incident, you almost certainly will put yourself and other responders in a position that is potentially life threatening. You risk unnecessary exposures to all of the hazards present in the danger zone of the incident. You will not recognize the need to isolate the immediate incident scene, establish a perimeter, and deny entry.

In other words, if you, the first responder, do not recognize the presence or potential presence of hazardous substances on the incident scene, **you are now part of the problem and cannot be part of the solution**.

## RECOGNITION AND IDENTIFICATION CLUES

Generally speaking, there are six established R&I clues available to emergency responders:

1. Occupancy and/or location.

2. Container/vehicle shape (size and configuration).

3. Markings and colors.

4. Placards and labels.

5. Papers (shipping papers, MSDS).

6. Senses.

The clues we are about to discuss can enable you to become part of the solution and not part of the problem. Learn them well because they are as much a part of your "personal protective ensemble" as a bulletproof vest, a set of turnouts, or steel-tipped shoes. The better you know and understand these clues, the safer you will be in the chemical world in which we live.

## Occupancy/Location

Occupancy and location are not new terms to many responders. Occupancy is the type of use to which a structure or location is dedicated. In other words, the building serves as a dwelling (single family, apartment, condo, townhouse, etc.), a business (office, etc.), an industry (manufacturer of some product), mercantile center (sales), storage (warehousing, etc.), farm, and so on.

Location is the specific geographic area, address, installation, etc., of the incident. The location can be along an Interstate highway, a rail line, or a pipeline; it can be a spot within a specific building or facility; or it can be the street address of a private dwelling.

Knowledge of the occupancy/location can provide vital information about the **potential** for the presence of hazardous materials. Consider the following occupancies and locations and the potential for the presence of hazardous substances in each:

- an outbuilding on a farm;
- a swimming pool sales store;
- a greenhouse;
- a metal plating or finishing shop;
- a woodworking shop;
- a personal garage;
- a vehicle accident involving any truck;
- a "you-store-it" facility;
- a pharmaceutical house; and
- the loading dock at a factory.

The bottom line is that **all** of these occupancies or locations have a strong probability of involving hazardous substances. From the occupancy and location, you also may get clues on the **type** of hazard involved.

If you respond to such a location and do not at least consider that hazardous substances may be present, you are part of the problem. It is the **responsibility of all response personnel** (for their own protection) to be familiar with their area of response and the types of occupancies and locations within that area that may contain hazardous substances. Knowledge about occupancy and location can provide critical information.

## Container/Vehicle Shape

Various types of containers are used to transport, handle, and store specific types of hazardous and nonhazardous materials. The appearance of these containers can tell you a lot about the product they hold and related hazards.

Clues include the container's shape, size, and composition; transport vehicle type; smoothness of the surface or "skin"; and visibility of related valving or piping. These clues can give some indication of the hazard class, type of product, level of pressurization, amount of product, etc.

In general, it is useful to classify containers by the maximum pressure they normally contain. In addition, because of certain fundamental differences between fixed facility and transportation incidents (highway, rail, water, air, or pipeline), it is helpful to look at these two categories separately. We will examine in more detail the various types of containers found in each category later in this unit.

## Markings and Colors

Markings and colors are R&I tools that can assist you in recognizing the possible presence of hazardous materials. Various systems are used by different producers and for different purposes. Except for those mandated by law or regulations, these systems are voluntary and can change with little or no notice.

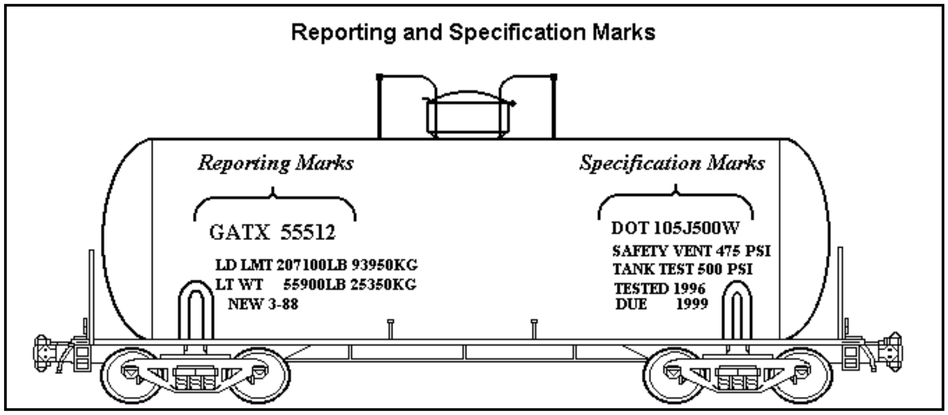
Several important systems of markings and colors:

- container markings and stencils;
- National Fire Protection Association (NFPA) 704 *Standard System for the Identification of the Fire Hazards of Materials* marking system;
- hazard communication systems; and
- military system.

### Railcar Stencils

All DOT specification containers must have markings indicating the particular DOT specifications they meet. The specifications **must** be met in order to transport DOT-regulated materials.

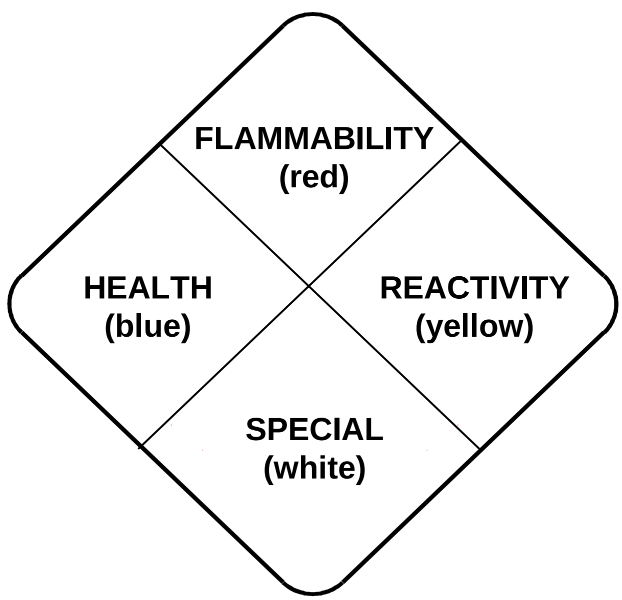
Other markings can include vehicle identification numbers and product stencils. Railcars provide a good example:




GATX 55512 identifies the specific car.
DOT 105 is the DOT specification.

## NFPA 704 System

The 704 system uses a diamond similar to a DOT placard subdivided into four smaller diamonds. The diamonds are color coded to indicate specific hazards.




**NFPA 704 Hazard System**

Within each diamond is a number from 0 to 4 indicating the hazard level in emergency situations. Zero indicates **no** hazard and 4 indicates a **major** hazard. For example, gasoline is listed as a 3 under flammability.

Special hazards include oxidizers, polymerization, water reactivity, etc. Most commonly the 704 system is used at fixed facilities.

## Hazard Communications (HazCom) System

This system commonly referred to as the Hazardous Materials Information System (HMIS) is used to meet Occupational Safety and Health Administration (OSHA) employee right-to-know requirements that are part of the hazard communications mandates. In general, the system provides basic information regarding the substance's name, hazards, safe handling and use. There are often indications as to appropriate personal protective equipment (PPE).

The HMIS uses a color and number system similar to the 704. In the case of HMIS, the color/number system can be found in the "diamond-within-a-diamond" or a color bar format. HMIS or HazCom information, colors, and markings are found on individual containers. The containers can range from pint jars to 55-gallon drums, and in some cases, to railcars.

It is vital to know that the information provided is specifically designed to inform employees of the hazards found in the "normal" work environment and **not during an emergency**.

Other color systems also exist. However, these systems generally are not uniform because usually they are voluntary. For example, there is supposedly a uniform compressed gas cylinder color-coding system that can be used by the entire industry. Unfortunately, most producers use **their own** color codes. Another example is the "candy stripes," the white rail tank car with red stripes used by certain manufacturers to transport hydrocyanic acid. Many manufacturers did not color code their cars this way. As of 2003, this color coding system has been phased out completely, although if there are still cars bearing this type of marking and they are still within specs., they can still be used as such.

## Military System

The military system, like the NFPA system, is specifically designed to address fixed locations. It generally is used on military installations, and not in transportation. You should be familiar with details of the military system if you have a base within your jurisdiction.

## Placards and Labels

**Labels** are symbols (at least a 4-inch square diamond) which **are affixed to the package being shipped**. Every business which offers a material classified as hazardous by the DOT must mark the package containing the material with the appropriate label or labels, unless otherwise specified. Additional requirements include

- When required, the label(s) must be affixed to, or printed on, the surface of the package near the proper shipping name.

- When two or more different warning labels are required, they must be displayed next to each other. These are known and primary and subsidiary hazards.

**Placards** are larger symbols (10-3/4-inch square diamond) which **are applied to the sides and end of a motor vehicle, railcar, freight container, or portable** tank containing hazardous materials (640 cubic feet or more). Additional requirements include

- Placards generally are not required on highway transportation until 1,000 kilograms or 2,205 pounds or more of a material is being transported.

- Exception: Explosives 1.1, 1.2, 1.3, Poison Gas 2.3, Dangerous When Wet 4.3, Organic Peroxide 5.2 (Type B, liquid or solid temperature controlled), Poison Inhalation Hazard 6.1 (Inhalation Hazard Zone A or B), Radioactive Yellow III must be placarded when any amount is transported.

Hazardous materials are grouped by major hazard into nine classes, which are defined as follows:

| **Class 1--Explosives**: any substance or article, including a device, which is designed to function by explosion. | |
|---|---|
| Division 1.1--Mass detonating | Examples: Dynamite, TNT, black powder |
| Division 1.2--Mass detonating with fragments | Examples: Propellant explosives, rocket motors, special fireworks |
| Division 1.3--Fire hazard with minor blast or projectile hazard | Examples: Common fireworks |

| | |
|---|---|
| Division 1.4--Substances which present no significant hazard | Examples: Small arms ammunition |
| Division 1.5--Very insensitive explosives | Examples: Ammonium nitrate fuel oil mixtures |
| Division 1.6--Extremely insensitive explosives | Examples: |
| **Class 2--Gases**: materials that are flammable, nonflammable, or poisonous gases. | |
| Division 2.1--Flammable gases | Examples: Propane, butadiene (inhibited), acetylene |
| Division 2.2--Nonflammable gases | Examples: Carbon dioxide, chlorine, methyl chloride, anhydrous ammonia |
| Division 2.3--Poison gases | Examples: Arsine, phosgene, hydrogen fluoride |
| **Class 3--Flammable Liquids**: any liquid with a flashpoint at or below 140° F. | |
| | Examples: Gasoline, acetone, methyl alcohol, toluene, amyl acetate |
| **Class 4--Flammable Solids and Substances**: materials that are wetted explosives, self-reactive, spontaneously combustible, pyrophoric, or water reactive. | |
| Division 4.1--Flammable solids | Examples: Pyroxylin plastics, magnesium, phosphorus |
| Division 4.2--Spontaneously combustible/pyrophoric | Examples: Aluminum borohydride, liquids celluloid scrap |
| Division 4.3--Dangerous When Wet | Examples: Metallic sodium, potassium, calcium carbide |
| **Class 5--Oxidizers**: materials that may, generally by yielding oxygen, cause or enhance the combustion of other materials. | |
| Division 5.1--Oxidizing substances | Examples: Ammonium nitrate fertilizer |
| Division 5.2--Organic peroxides | Examples: Benzoyl peroxide, peracedic acid, acetyl peroxide solution |

| | |
|---|---|
| **Class 6--Poisons**: materials, other than a gas, which are known to be so toxic to humans as to afford a hazard to health during transportation. | |
| Division 6.1--Poisons | Examples: Carbon tetrachloride, aniline, arsenic, methyl bromide, tear gas |
| Division 6.2--Infectious substances | Examples: Anthrax, botulism, rabies, tetanus |
| **Class 7--Radioactive Materials**: materials or combinations of materials that spontaneously emit ionizing radiation. | |
| | Examples: Plutonium, cobalt, uranium hexafluoride |
| **Class 8--Corrosives**: a liquid or solid that causes visible destruction or irreversible alterations in human skin tissue at the site of contact, or a liquid that has a severe corrosion rate on steel or aluminum. | |
| | Examples: Hydochloric acid, sulfuric acid, sodium hydroxide, nitric acid |
| **Class 9--Miscellaneous Hazardous Materials**: materials that present a hazard during transport, but which are not included in any other hazard class. | |
| | Examples: Unslaked lime, metallic mercury, dry ice, bleaching powder, molten sulfur, PCB's, nitrous oxide |
| **ORM-D--Consumer commodities** | Examples: Household ammonia, spot remover |

Both labels and placards denote **only the major hazard**. Many materials have properties that meet the criteria of more than one class. The DOT has established the following **class priority for materials having more than one hazard class**:

- radioactive material;
- flammable gas;
- nonflammable gas;
- flammable liquid;
- oxidizer;
- flammable solid;
- corrosive material (liquid);
- corrosive material (solid);

- irritating materials;
- combustible liquid (containers more than 110 gal.); and
- combustible liquid (containers less than 110 gal.).

Exceptions to this priority sequence are provided by the DOT for explosives, etiologic agents, and organic peroxides (see 49 CFR 173.2).

### Shipping Papers/Material Safety Data Sheets

Different types of shipping papers are used for different modes of transportation. In general, the person in charge of the vehicle is the person who will have the papers.

The papers should be located

- In the cab of a truck or with the driver in highway transport. Papers are called a **bill of lading**.

- In the engine (or caboose if present) or with the crew in rail transport. Papers are called a **consist**.

- In the wheelhouse or a special container on a barge, or with the crew in ships. Papers are called a **dangerous cargo manifest**.

- In the cockpit or with the pilot of an aircraft. Papers are called an **air bill**.

As previously discussed, MSDS's are also an important source of R&I information for responders. They may be found with the shipping papers. Other possible sources of MSDS's include your State Emergency Response Commission (SERC), Local Emergency Response Committee (LEPC), product manufacturers, fixed facilities that use or store the chemical, and fire departments. Remember: Emergency services have the right to request copies of MSDS forms for use in incident planning and operations.

### Human Senses

Vision plays a key role in all clues we have discussed so far, and in determining the presence of fire, smoke, vapor or gas clouds, etc. Unfortunately, our sense of vision is limited when light or visibility is poor.

Hearing also is important, especially when witnesses are present or there are unusual sounds. However, remember to remain at a safe distance when trying to gain information about an incident through vision or hearing.

The use of other senses--taste, touch, or smell--risks an exposure to the substance. These senses should **not** be used intentionally in an incident.

### Summary of the Six Clues

Consider the following situations.

1. No police officer would respond to a reported silent alarm at a bank or a store without at least suspecting **that there may be a robbery/burglary** in progress. The officer would not simply go to the front door and walk in, unless he or she was rather foolish.

2. No medic would respond to a reported severe laceration of a patient at an AIDS clinic without donning disposable gloves and possibly other protective clothing as well. To do so also would be foolish on the part of the medic.

3. No firefighter would walk into the living room of a house with smoke banked down to the floor without wearing full structural firefighting equipment. Again, to do so is nothing short of foolish.

In each case, the actions described go against all of the normal safety procedures for the agencies involved. A responder who would take the actions described would be a danger to him/herself and certainly not a credit to the profession. The same is true for hazardous materials. A responder who does not consider the six clues of R&I--occupancy/location, container shape, markings and colors, placards and labels, shipping papers and MSDS, and senses--places his/her life and that of his/her coworkers in danger.

## TRANSPORTATION CONTAINERS

Hazardous materials are transported in many forms and quantities throughout our country. As a result, every community must be prepared to deal with a broad spectrum of transportation incidents that occur randomly and that can be particularly difficult to handle. However, most situations provide a tremendous number of clues for emergency responders **if you know what to look for.**

Containers for hazardous materials vary somewhat among the five modes of transportation: highway, rail, water, air, and pipeline. We will look at each briefly.

### Highway Transportation

Approximately 50 percent of **all** highway transports carry hazardous materials (not counting the gasoline in their fuel tanks). This percentage may increase significantly at night when there is less local traffic. Of those that carry hazardous materials, only 50 percent are required to display placards. For these reasons, highway incidents are common and can be difficult to analyze.

Many different types of highway transport vehicles exist. The basic types include the box trailer, flatbed, dry bulk, van, tank trailer, tube trailer, and personal vehicle.

**Box Trailer**

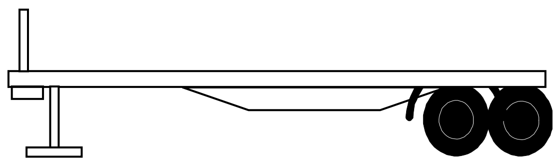
**Box trailers** are one of the most common types of vehicles found on the highways. They may contain materials that fall into one of the following hazard classes:

- flammable liquids, solids, or gases;
- oxidizers;
- corrosives;
- poisons;
- compressed gases; and
- radioactive materials, explosives, or various combinations of these materials.

Most commonly, a box trailer is filled with smaller containers. These containers may be cylinders, drums, cardboard or wooden boxes, paper and plastic bags, glass jars, or almost any other imaginable type of small container.

**One of the problems with these vehicles is that the true nature of the problem is hidden by the walls of the trailer.** The approach and/or opening of these trailers can be extremely dangerous due to the inability to see what is, or has happened, inside the trailer.

**Flatbeds** most commonly transport large objects that are difficult to load on any other type of transport. These objects can be large containers of hazardous materials (all classes).



**Flatbed**

**Dry bulk** units carry solid materials in the form of dusts, powder, pellets, etc. These materials can be corrosives, oxidizers, and other hazard class material appropriate for the unit.

**Dry Bulk**

**Vans** are very similar in all respects to the box trailer except that instead of a tractor and trailer, the box trailer and tractor are on the same frame. Often these units carry relatively small quantity containers of hazardous materials and do not require placards.

**Van**

**Tank vehicles** present a slightly different situation compared to the previously mentioned types. In most instances, these cargo tankers are **intended** to ship hazardous materials. As such, they are regulated by the DOT in 49 CFR.

A helpful way to examine tankers is to consider the maximum pressures that should be found in the unit.

In highway transportation, there are **three basic types of tankers** with regard to pressure--atmospheric, low pressure, and high pressure.

- Atmospheric can have maximum internal pressures of from 0 to 5 psi.

- Low pressures can have maximum internal pressures of from 5 to 100 psi.

- High pressures can have maximum internal pressures of from 100 to 3,000 psi.

**Atmospheric tankers** are used to transport low-volatility liquids (in other words, low vapor pressure). They will have an **elliptical cross-sectional shape** and the surfaces of the tank are smooth.

Common materials transported in tankers are gasoline, diesel fuel, and other liquid fuels. In some cases, mild poisons and other hazard-class materials also can be transported in these units.


**Atmospheric Tankers**
**(Low Volatility Liquids)**

**Low-pressure tankers** handle corrosive and high-volatility liquids. They may have a **round or "horseshoe" shaped cross-section**. The round units have ribs at various points, going around the tank. The horseshoe units have a smooth skin.

**Low Pressure**

**High-pressure tankers** have a **round cross section** but the skin will be smooth. The **ends of the unit are hemispherical.** Normally, the maximum pressure is 250 psi. These units will transport products such as liquefied petroleum and other liquefied compressed gases. As such, they are susceptible to **B**oiling-**L**iquid, **E**xpanding **V**apor **E**xplosions or **BLEVE** (pronounced blev-ee).

**High Pressure**

**Special high-pressure tankers** are unique for two reasons. The first reason is that the liquefied gases inside them are at temperatures from -150°F to below -450°F (-101° to -268°C). The second reason is that the pressure must be reduced to 25 pounds per square inch (psi) or less during the transportation of the product.

However, during onloading and offloading, the pressure commonly goes above 100 psi to aid in the transfer process. These **units can be round, or round and square**, depending upon the manufacturer.


**Special High-Pressure**
**(Cryogenics)**

**Tube trailers** are nothing more than **a group of overgrown compressed gas cylinders** attached to a trailer frame. They contain gases under high pressure.

**Tube Trailer**

**Personal vehicles** found on the roads cannot be overlooked. People will often put almost anything that will fit into their vehicles. In other words, you can find almost anything under the sun in personal vehicles and normally you will not know it.

What appear to be private vehicles often are used to transport radioactive pharmaceuticals, various industrial chemicals, household-use gases, flammable liquids, flammable gases, etc. Consider what **you** have carried in your car or truck.

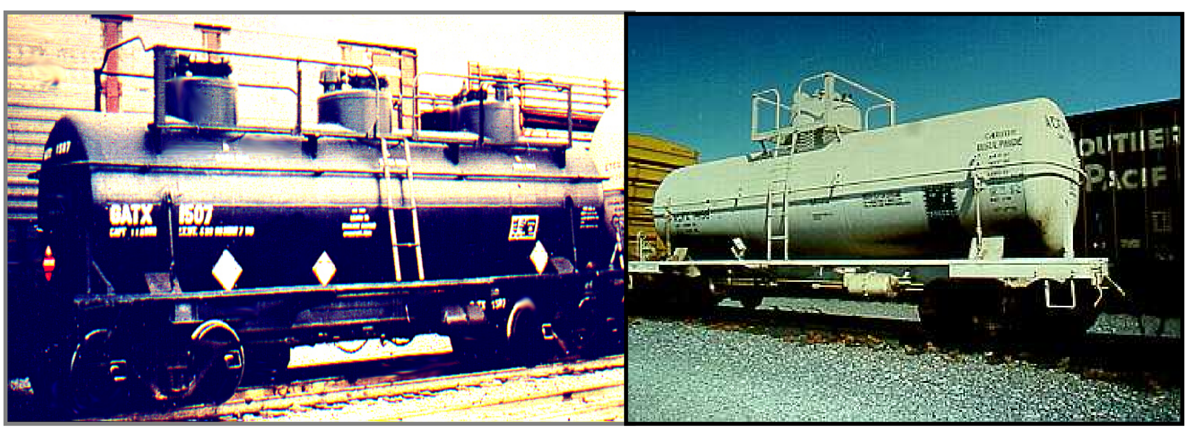
## Rail Transportation

The primary types of railcars are box, flat, hopper, bulk, tank, and tube. In most cases, these **cars are similar in use to their corresponding highway counterparts** and haul the same types of hazardous materials, except in larger quantities. The **primary exception is the hopper car** which is used to haul bulk quantities of products such as coal.

### Rail Tank Cars

The rail industry classifies tank cars in two classes: nonpressure and pressure. The term "nonpressure" is a misnomer because nonpressure cars can have pressures up to 100 psi.

**Nonpressure cars** carry liquids or solids that can be liquefied by heating for onloading and offloading. The liquids can be flammables, corrosives, poisons, oxidizers, etc. The solids can be materials like sulfur, phosphorous, etc.




**Nonpressure Cars**

All **pressure cars** can carry liquefied compressed gases that may be flammable: poisons, oxidizers, asphyxiants, or any combination of these hazards.

Unlike highway transportation, the only good method at the first responder's level to tell the difference between nonpressure and pressure cars is by the arrangement of the attachments found on top of the car.

**Pressure cars have a large, round device on the top referred to as a bonnet**, which contains all of the valving assemblies for the car. On the other hand, nonpressure cars normally have several different shaped devices readily visible.

All pressure cars are designed to transport hazardous materials, while not all nonpressure cars are so designed. Again, just like in the cargo tanks, if they are designed to haul hazardous materials, the tank car specifications must meet the DOT regulations found in 49 CFR.


**Pressure Cars**

## Other Transport Types

### Water Transport

Ships and barges are used in water transportation. The primary difference between a ship and a barge is that a ship has its own powerplant, while a barge must rely upon a ship for its movement.

Either a ship or a barge can carry phenomenally large quantities of product, causing tremendous problems during an incident.

## Combination Mode Shipments

Some types of containers can be transported by highway, rail, or water. These containers are referred to as intermodal containers. They may be trailers, box-like containers, or a tank supported by a frame.

In rail transport, the containers are often affixed to flatcars. In this setting, they are referred to by special names. If the container is a truck trailer, it is referred to as a trailer on flatcar, or TOFC. If the container is simply a large box, it is referred to as a container on flatcar, or COFC.


**Trailer on a Flat Car (TOFC)**

**Container on a Flat Car (COFC)**

Air Transport

In air transport, the primary carrier is the airplane. They may be dedicated cargo ships or, in a few situations, passenger service planes. In any event, the specific requirements for the shipment of materials are closely regulated by DOT in 49 CFR.

Generally, the quantities are limited to less than 50 pounds even on dedicated cargo transports. An ever-present hazard with planes is the presence of fuel that is used to power the plane.

Pipeline

The last mode of transportation is the pipeline. There is scarcely a location in this country that does not have a pipeline running through the area. These pipelines range from the natural gas mains in the street to massive interstate pipelines that handle millions of gallons of product each day.

## Activity 5.1

## Recognizing Transportation Containers

### Purpose

To practice recognizing container types, uses, hazard classes, and other information.

### Directions

1. You will be shown a series of five slides, each one depicting a different haz mat transportation scene.

2. Study each slide, then identify the type of transport vehicle and the hazard class in the appropriate space below.

3. In addition, note other information you can derive from the slide such as possible product name or type, pressure, and precautions.

4. You will discuss each slide as a class.

## Activity 5.1 (cont'd)

## Worksheet

### Slide 5-55

Transport vehicle type: ____________________

Hazard class(es): ____________________

Other information: ____________________

____________________

____________________

### Slide 5-56

Transport vehicle type: ____________________

Hazard class(es): ____________________

Other information: ____________________

____________________

____________________

### Slide 5-57

Transport vehicle type: ____________________

Hazard class(es): ____________________

Other information: ____________________

____________________

____________________

## Slide 5-58

Transport vehicle type: ____________________________________________

Hazard class(es): ________________________________________________

Other information: _______________________________________________

_____________________________________________________________

_____________________________________________________________

## Slide 5-59

Transport vehicle type: ____________________________________________

Hazard class(es): ________________________________________________

Other information: _______________________________________________

_____________________________________________________________

_____________________________________________________________

## FIXED-SITE CONTAINERS

Fixed facilities can have almost any kind of container under the sun, including any or all of the types previously mentioned under shipping modes. Fixed facility containers can be classified by their pressure rating in a fashion similar to those found in transportation. However, a new category--ultrahigh pressure--is added.

The pressure types:

- atmospheric-- 0 to 5 psi;
- low pressure--5 to 100 psi;
- high pressure--100 to 3,000 psi; and
- ultrahigh pressure--above 3,000 psi.

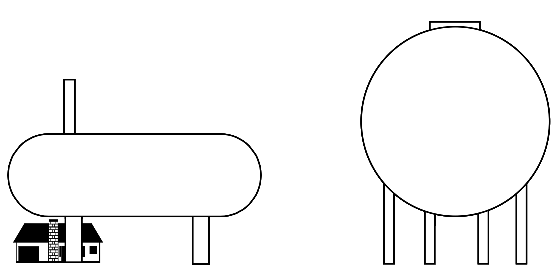
**Atmospheric** containers can include all types such as bags, boxes, drums, or tanks. They contain products that are liquids or solids under normal conditions. Size can range from extremely small to quite large. Configurations vary and multicontainer packages are common. Many liquid fuel storage tanks, above and belowground, fall into this category.

**Low-Pressure** containers such as storage tanks are designed to contain volatile liquids and solids, and in some cases, gases (pipelines). Common locations include equipment/processing facilities. Only certain drums, most of which have pressure relief valves, are in this category.

**High-pressure** containers such as propane and other compressed gas cylinders can be found as spheres or cylinders above or belowground. A common example is medical oxygen cylinders. High-pressure containers normally hold gases, liquids, or powders.

**Ultrahigh-pressure** containers such as tube tanks, pipelines, or cylinders are not common and contain mostly gases and a few liquids. They are usually aboveground and horizontal.

**Ultrahigh-Pressure**

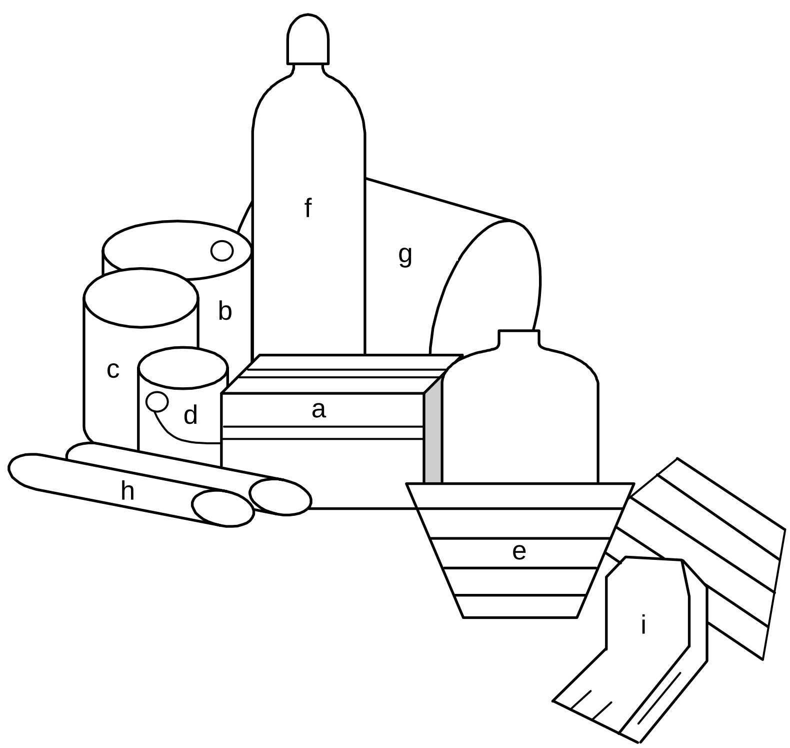


**When used as ultrahigh-pressure containers, these containers are reinforced.**

## Individual Containers

Smaller quantities of hazardous materials may be found in containers made of many different materials and in various sizes and shapes. Materials designated as hazardous by the DOT usually will be packed in containers manufactured according to DOT specifications, and will have appropriate DOT labels affixed thereto. Containers made of different materials and in various sizes and shapes include

a. Wooden boxes.
b. Metal drums.
c. Fiberboard drums.
d. Plastic pails.
e. Glass carboys in protective containers.
f. Cylinders.
g. Ton cylinders.
h. Mailing tubes.
i. Multiwall paper bags.



## USING THE DEPARTMENT OF TRANSPORTATION *NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK*

The NAERG was developed by the DOT for use by first responders, including firefighters, police, EMS personnel, and others. It contains guidance helpful primarily during the initial phases of a hazardous materials incident. The DOTNAERG was designed for use in highway or railroad incidents, but it will, with certain limitations, be useful in other emergency situations.

A numbered guide is assigned to each hazardous material listed in the index. Each guide provides only the most vital information in a brief practical form, including the most significant potential hazards and information concerning recommended initial actions. Basic steps for using the guide are

1. Identify the material using the product name or the four-digit ID number on placards or shipping papers.

2. Look up the materials' two-digit guide number.

3. Turn to and read the numbered guide.

The DOTNAERG is an invaluable resource for all first responders. You should be familiar with its format, use, and limitations in a hazardous materials incident.

## Activity 5.2

## Recognizing and Identifying Hazards

### Purpose

To identify the appropriate information using the DOTNAERG.

### Directions

1. You will view a series of slides. Identify the appropriate information on each slide.

2. Each slide will be left on the screen for **1 minute**. In that minute, you must

    a. Identify the type of container with regard to pressure.

    b. Identify the probable state of the product.

    c. Identify the product, using the DOT ERG when and if possible.

## Activity 5.2 (cont'd)

## Worksheet

### Slide 5-68

Container(s) Information:

Transport/Fixed ______________________________

Pressure ______________________________

Other Information ______________________________

______________________________

Substance(s): ______________________________

Physical State ______________________________

Hazard Class(es) ______________________________

UN ID# ______________ DOT Guide # ______________

### Slide 5-69

Container(s) Information:

Transport/Fixed ______________________________

Pressure ______________________________

Other Information ______________________________

______________________________

Substance(s): ______________________________

Physical State ______________________________

Hazard Class(es) ______________________________

UN ID# ______________ DOT Guide # ______________

## Slide 5-70

Container(s) Information:

Transport/Fixed ______________________________________________

Pressure ______________________________________________

Other Information ______________________________________________

______________________________________________

Substance(s): ______________________________________________

Physical State ______________________________________________

Hazard Class(es) ______________________________________________

UN ID# ______________________ DOT Guide # ____________________

## Slide 5-71

Container(s) Information:

Transport/Fixed ______________________________________________

Pressure ______________________________________________

Other Information ______________________________________________

______________________________________________

Substance(s): ______________________________________________

Physical State ______________________________________________

Hazard Class(es) ______________________________________________

UN ID# ______________________ DOT Guide # ____________________

## Slide 5-72

Container(s) Information:

Transport/Fixed ____________________________________________

Pressure ________________________________________________

Other Information ___________________________________________

______________________________________________________________

Substance(s): ______________________________________________

Physical State ______________________________________________

Hazard Class(es) ____________________________________________

UN ID# ______________________ DOT Guide # __________________

## Slide 5-73

Container(s) Information:

Transport/Fixed ____________________________________________

Pressure ________________________________________________

Other Information ___________________________________________

______________________________________________________________

Substance(s): ______________________________________________

Physical State ______________________________________________

Hazard Class(es) ____________________________________________

UN ID# ______________________ DOT Guide # __________________

# APPENDIX

Slide 5-1

**UNIT 5:
INTRODUCTION TO
RECOGNITION AND
IDENTIFICATION**

Slide 5-1

Slide 5-2

**TERMINAL OBJECTIVE**

**The students will be able to identify the hazard class and, if possible, the product name of hazardous materials found at an emergency scene.**

Slide 5-2

Slide 5-3

**ENABLING OBJECTIVES**

**The students will:**

- **List six clues for hazardous materials recognition and identification.**
- **Recognize the appropriate United Nations/Department of Transportation (UN/DOT) hazard class of various substances.**
- **Identify the product name using UN identification numbers.**

Slide 5-3

Slide 5-4

## ENABLING OBJECTIVES (cont'd)

- **From a silhouette, recognize the general type of container, product, and hazards that may be present.**
- **Demonstrate the use and interpretation of the DOT *North American Emergency Response Guidebook* (NAERG).**

Slide 5-4

Slide 5-5

**Recognition and identification (R&I) is the first and most essential tool to save your life at a hazardous materials incident.**

Slide 5-5

Slide 5-6

## SIX CLUES

- **Occupancy/Location**
- **Container shape**
- **Markings and colors**
- **Placards and labels**
- **Shipping papers and material safety data sheets (MSDS)**
- **Human senses**

Slide 5-6

Slide 5-7

**CLUE #1: OCCUPANCY/LOCATION**

- **Type of use for a given location: residential, industrial, mercantile, etc.**
- **Specific incident scene: production, storage, use or transport, type of transport, etc.**

Slide 5-7

Slide 5-8

**CLUE #2: CONTAINER SHAPES**

- **Transportation containers**
- **Fixed-site containers**

Slide 5-8

Slide 5-9

**TRANSPORTATION CONTAINER MODES**

- **Highway**
- **Rail**
- **Water**
- **Air**
- **Pipeline**

Slide 5-9

Slide 5-10

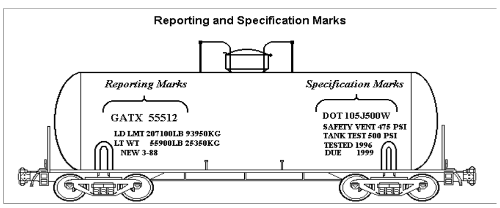
## CLUE #3: MARKINGS AND COLORS

- Railcar stencils
- NFPA 704
- Hazard communications
- Military

Slide 5-10

Slide 5-11

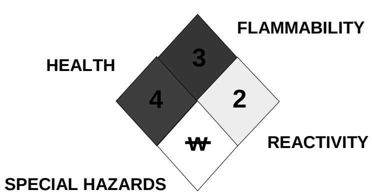
## RAILCAR STENCIL




Slide 5-11

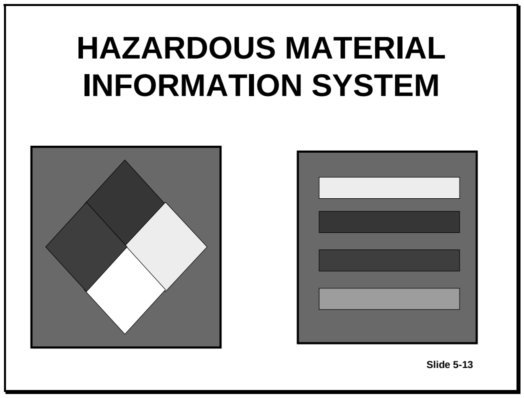
Slide 5-12

## NFPA 704

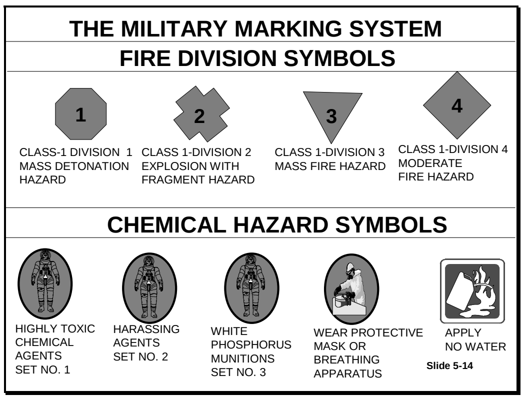



Slide 5-12

Slide 5-13




Slide 5-14



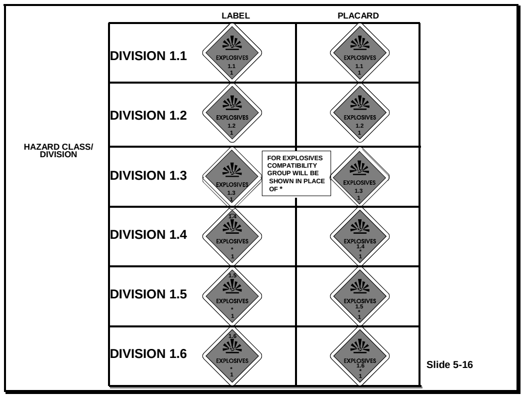

Slide 5-15

**CLUE #4:**
**DOT/UNITED NATIONS HAZARD**

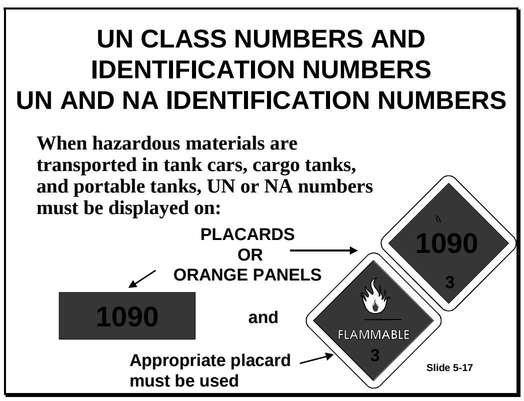
| |
|---|
| CLASS 1-EXPLOSIVES (6 DIVISIONS) |
| CLASS 2-GASES (3 DIVISIONS) |
| CLASS 3-FLAMMABLE LIQUIDS (3 DIVISIONS) |
| CLASS 4-FLAMMABLE SOLIDS (3 DIVISIONS) |
| CLASS 5-OXIDIZERS (2 DIVISIONS) |
| CLASS 6-POISONS (2 DIVISIONS) |
| CLASS 7-RADIOACTIVE MATERIALS |
| CLASS 8-CORROSIVES |
| CLASS 9-MISCELLANEOUS |
| CLASS D-CONSUMER COMMODITIES |

Slide 5-15

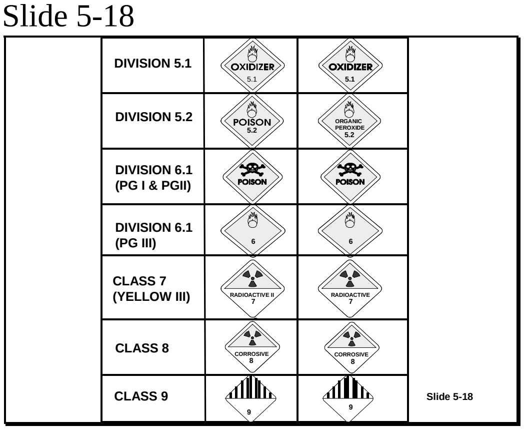
Slide 5-16




Slide 5-17




Slide 5-18



Slide 5-19

**CLUE #5**
**SHIPPING PAPERS**

| | NAME | LOCATION |
|---|---|---|
| HIGHWAY | *BILL OF LADING* | *CAB/ DRIVER* |
| RAIL | *CONSIST* | *ENGINE/ CABOOSE CREW* |
| WATER | *DANGEROUS CARGO MANIFEST* | *WHEELHOUSE/ PAPER BOX CREW* |
| AIR | *AIR BILL* | *COCKPIT PILOT* |

Slide 5-19

Slide 5-20

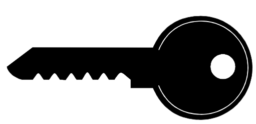
**MATERIAL SAFETY DATA SHEET**

- **Primary data sources for fixed sites**
- **Data:**
  - **Substance names**
  - **Properties**
  - **Physical and health hazards**

Slide 5-20

Slide 5-21

**CLUE #6**
**KEY SENSES**



- **Vision**
- **Hearing**
- **Others can lead to exposure!**

Slide 5-21

Slide 5-22

## SIX CLUES

- Occupancy/Location
- Container shape
- Makings and colors
- Placards and labels
- Shipping papers and MSDS
- Human senses

Slide 5-22

Slide 5-23

## HIGHWAY TRANSPORTATION INCIDENT

- A common type
- Can be extremely difficult to handle

Slide 5-23

Slide 5-24

## NATIONAL AVERAGES

- Fifty percent of all trucks are transporting hazardous materials.
- Only 50 percent of these trucks are required to display warning placards.
- These percentages may increase at night.

Slide 5-24

Slide 5-25

## TYPES OF HIGHWAY TRANSPORTS

- **Box trailer**
- **Flatbed**
- **Dry bulk**
- **Van**
- **Tank trailer**
- **Tube trailer**
- **Personal vehicle**

Slide 5-25

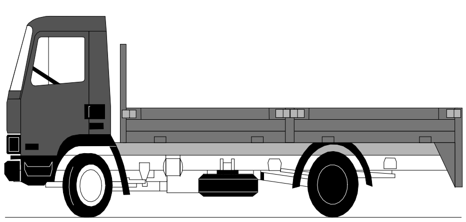
Slide 5-26

## BOX TRAILER

Slide 5-26

Slide 5-27

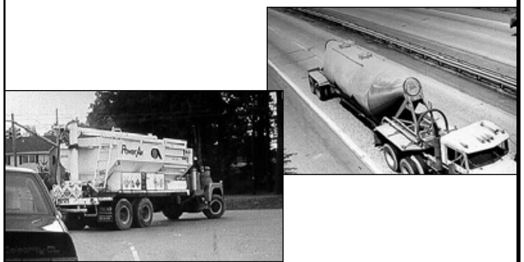
## FLATBED



Slide 5-27

Slide 5-28

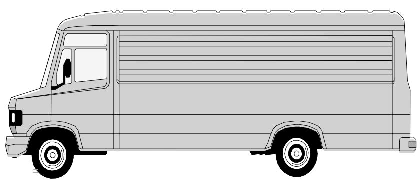
## DRY BULK



Slide 5-28

Slide 5-29

## VAN



Slide 5-29

Slide 5-30

## TANK TRAILER (CARGO TANKS)

- **Many individual types.**
- **Design specifications for hazardous materials units are regulated by the Department of Transportation (DOT).**
- **Type of vehicle is based on the properties of the product handled.**

Slide 5-30

Slide 5-31

## TANK TRAILER CLASSIFICATION BY PRESSURE

- **Atmosphere--0 to 5 psi**
- **Low Pressure--5 to 100 psi**
- **High Pressure--100 to 3,000 psi**

Slide 5-31

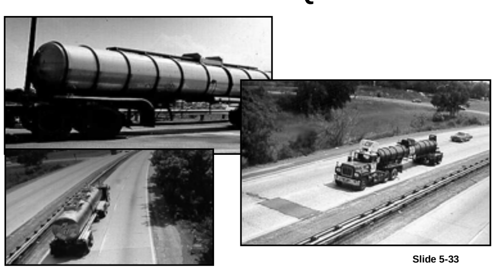
Slide 5-32

## ATMOSPHERIC LOW-VOLATILITY LIQUIDS


Slide 5-32

Slide 5-33

## LOW-PRESSURE CORROSIVES AND HIGH-VOLATILITY LIQUIDS



Slide 5-33

Slide 5-34

## THREE TYPES OF HIGH PRESSURE

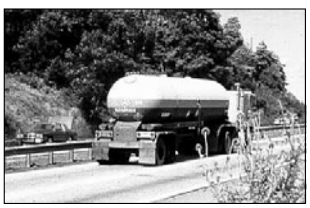
- **High pressure**
  - **Liquefied compressed gas**
  - **Special high pressure**
- **Cryogenic liquids**
  - **Tube trailer**

Slide 5-34

Slide 5-35

## HIGH PRESSURE

- **Liquefied gases**
- **Maximum pressure 250 psi**



Slide 5-35

Slide 5-36

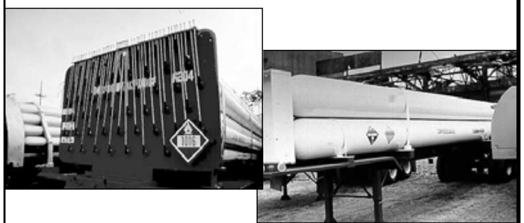
## SPECIAL HIGH PRESSURE

- **Refrigerated liquefied gases.**
- **Pressure must be reduced during transport.**

Slide 5-36

Slide 5-37

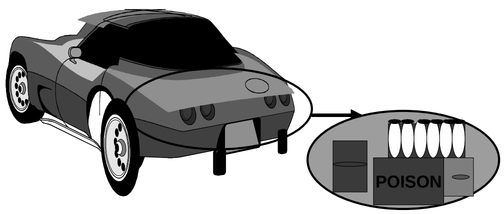
**TUBE TRAILER**
**HIGH-PRESSURE GAS**



Slide 5-37

Slide 5-38

**PERSONAL VEHICLES**




Slide 5-38

Slide 5-39

**RAIL TRANSPORTATION**
**INCIDENTS**

- **Can be extremely difficult to handle**
- **Involve large quantities of product**
- **Often have poor access**
- **Involve multiple cars and multiple products**

Slide 5-39

Slide 5-40

## RAILCAR TYPES

- **Box**
- **Flat**
- **Hopper**
- **Bulk**
- **Tank**
- **Tube**

Slide 5-40

Slide 5-41

## TANK CAR TYPES

- **Two types:**
  - **Nonpressure (less than 100 psi)**
  - **Pressure (greater than 100 psi)**
- **Specifications are regulated by DOT if hauling hazardous materials.**

Slide 5-41

Slide 5-42

## NONPRESSURE CARS

**Carry liquids or solids that can be liquefied**

## PRESSURE CARS

**Carry liquefied gases**

Slide 5-42

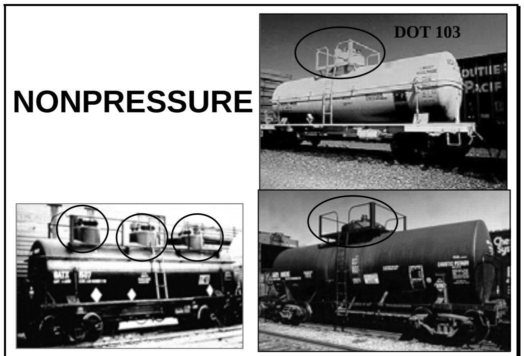
Slide 5-43

**The arrangement on the top allows one to differentiate between nonpressure and pressure cars.**

Slide 5-43

Slide 5-44

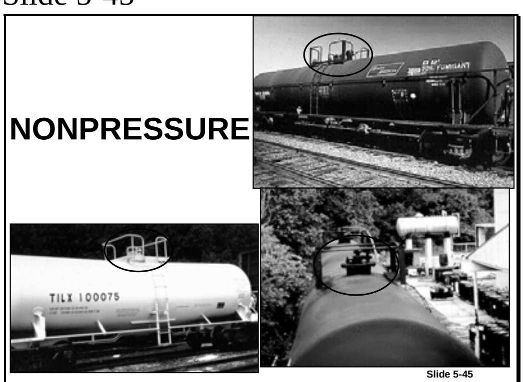
**NONPRESSURE**




Slide 5-44

Slide 5-45

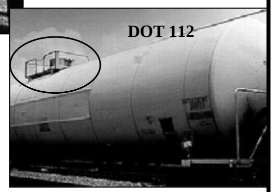
**NONPRESSURE**




Slide 5-45

Slide 5-46


**PRESSURE**




Slide 5-46

Slide 5-47

**WATER TRANSPORTATION**

- **Ships**
- **Barges**

Slide 5-47

Slide 5-48

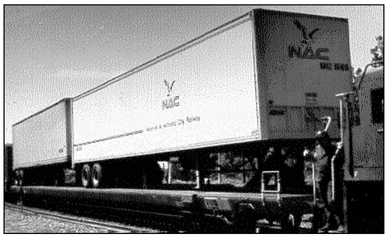
**COMBINATION MODE SHIPMENTS**

- **Go from highway to rail to water**
- **Called intermodals**
- **Carry any type of hazardous material**

Slide 5-48

Slide 5-49

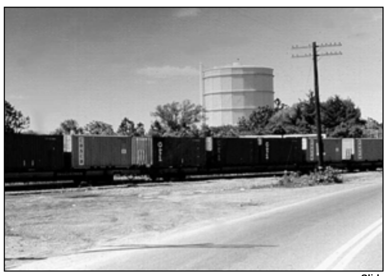
## INTERMODAL TRUCKBOX (TOFC)



Slide 5-49

Slide 5-50

## INTERMODAL BOX (COFC)



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## INTERMODAL TANK

Slide 5-51

Slide 5-52

## AIR TRANSPORTATION

- **Heavily regulated due to potential hazards.**
- **Limited quantities allowed; fuel is a consideration.**

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## PIPELINES

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Slide 5-54

## Activity 5.1
## Recognizing Transportation Containers

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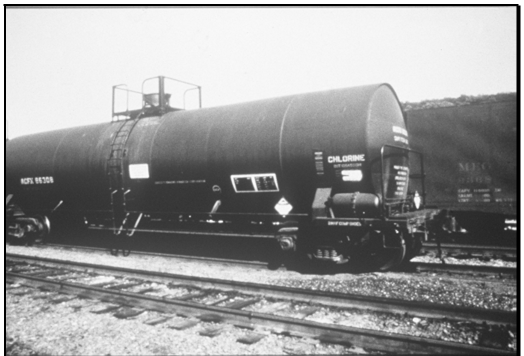


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## FIXED SITE CONTAINERS

- **Almost any type of container**
- **Often include highway, rail, air, or water containers**

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## PRESSURE CLASSIFICATION

- **Atmospheric--0 to 5 psi**
- **Low Pressure--5 to 100 psi**
- **High Pressure--100 to 3,000 psi**
- **Ultrahigh Pressure--greater than 3,000 psi**

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## ATMOSPHERIC CONTAINERS

- **They are used for products that are normally liquids or solids.**
- **Examples:**
  - **Bags.**
  - **Cans.**
  - **Jars.**
  - **Drums.**
  - **Boxes.**
  - **Liquid fuel storage tanks.**

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## LOW-PRESSURE CONTAINERS

- **They are used for volatile liquids or solids and some gases.**
- **Examples:**
  - **Some drums.**
  - **Equipment/ Processing.**
  - **Storage tanks.**
  - **Pipelines.**

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## HIGH-PRESSURE CONTAINERS

- **They are used for gases, liquefied gases, and some liquids.**
- **Examples:**
  - **High-pressure pipelines.**
  - **Liquefied compressed gas cylinders, spheres.**
  - **Compressed gas cylinders and tubes.**

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## ULTRAHIGH-PRESSURE CONTAINERS

- **They are used for gases and some liquids.**
- **Examples:**
  - **Tube banks.**
  - **Pipelines.**
  - **Cylinders.**

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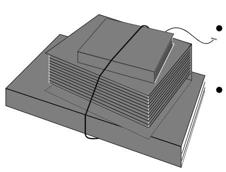
Slide 5-66

## DOT *NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK* (DOTNAERG)



- **Is an information source**
- **Has four primary parts**

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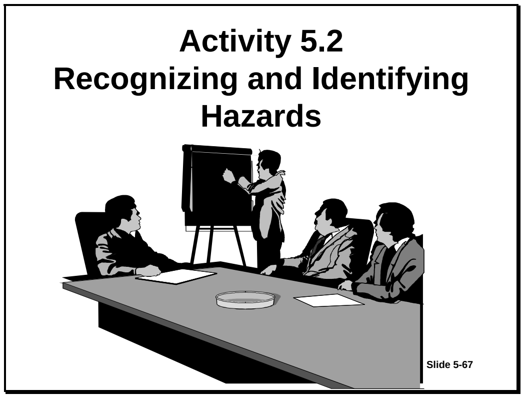


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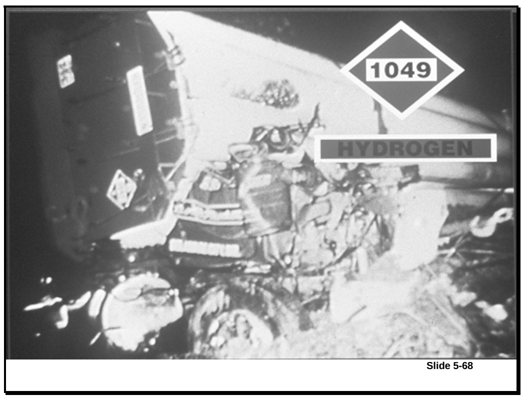


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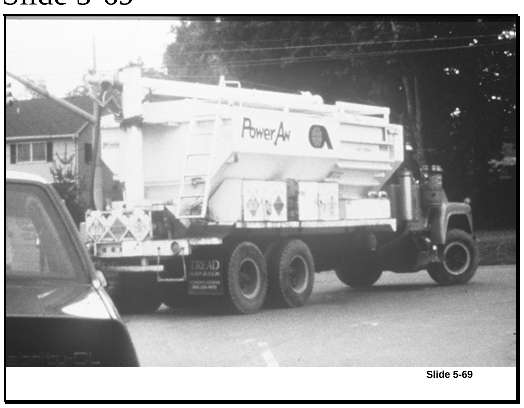

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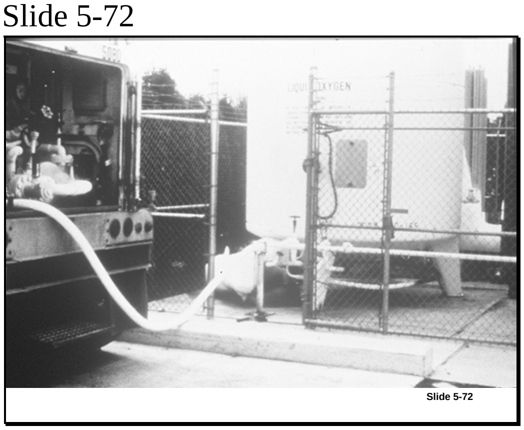

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## KEY POINTS

- Six clues:
  – Occupancy/Location.
  – Container shapes.
  – Markings and colors.
  – Placards and labels.
  – Shipping papers/MSDS's.
  – The five senses.
- You must become familiar with container types and categories:
  – Transportation (five modes).
  – Fixed site.
- The DOTNAERG is a valuable tool for recognition and identification.

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# *UNIT 6:*
# *SITE MANAGEMENT AND SCENE SETUP*

### *TERMINAL OBJECTIVE*

*The students will be able to identify the advantages and implications of basic concepts and procedures used in hazardous materials site management and scene setup.*

### *ENABLING OBJECTIVES*

*The students will:*

1. *Describe the purpose of the Incident Command System (ICS) in hazardous materials response.*

2. *Describe the role of the first responder in the ICS.*

3. *Identify the advantages of using incident levels.*

4. *Identify the three incident zones.*

5. *Identify six personal hazards that may be associated with each of the three zones.*

6. *Identify specific personal protective equipment (PPE) requirements for each of the three zones.*

## INTRODUCTION

Federal regulations on hazardous materials response contain specific mandates describing how the incident will be set up and managed. Many of the concepts expressed in the regulations and standards are somewhat unfamiliar to many responders. This is true for two reasons. First, until recently, the specified management system has generally been a fire-service system. Second, hazardous materials scene setup considerations and related concepts are quite different from most routine emergency response situations. In this unit, we will explore some of the similarities and differences.

Both the Occupational Safety and Health Administration's (OSHA) 29 Code of Federal Regulations (CFR) Part 1910.120 and the Environmental Protection Agency's (EPA) 40 CFR Part 311 state: "The Senior Emergency Response Official responding to a (chemical) emergency **shall** become the individual in charge of the Site Specific Incident Command System." This means that **all hazardous materials emergency responders must operate using the Incident Command System (ICS)**. The obvious question is: "What is the Incident Command System?"

The terminology used in this program is that used by the National Fire Academy (NFA) in its incident command training. This is done strictly for the sake of uniformity during classroom delivery. It is recognized that different terminology may be used depending on the location or jurisdiction. The particular terminology adopted is not critical, but **one unified** system must be established in your standard operating procedures (SOP's). All parties must use the same system and terminology for that system.

## HISTORY OF THE INCIDENT COMMAND SYSTEM

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

FIRESCOPE derives its name from: **FI**re **RES**ources of **C**alifornia **O**rganized for **P**otential **E**mergencies. The FIRESCOPE ICS is primarily a command and control system delineating job responsibilities and organizational structure for the purpose of managing day-to day operations for all types of emergency incidents. While originally developed for wildland incidents it was found that the system could be applied easily to day-to-day fire and rescue operations. It also is flexible enough to manage catastrophic incidents involving thousands of emergency response and management personnel.

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

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

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

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

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

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

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

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

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

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

## Need for a Comprehensive System

Throughout the country, multiagency or multijurisdictional disasters led to the development of improved interagency incident management capabilities that could be used at major incidents. All agencies recognized the advantage of combining resources under a common organizational structure. They also recognized that this system should not be for multiagency, major emergencies only, but **should be a day-to-day operational system for each agency**.

The ICS requires mutual agreement and/or acceptance of: 1) organizational structure, 2) common operating procedures, 3) common terminology, and 4) personnel qualifications (trained in the system). Such a system represents a giant step not only for the fire service but for emergency response in general. It allows the **coordinated** use of personnel from many different agencies to operate as a single unit. In other words, the ICS provides a uniform national emergency incident management capability.

To ensure proper incident management through coordination of overall operations, a responsive organization must be developed. The IC must be able to communicate effectively within the organization and to assess feedback from all involved in the incident. The use of a specific command structure and terminology is vital to the management of the system.

Because hazardous materials incidents, like most incidents, are dynamic, frequent shifts within the plan of action can be anticipated. The ICS provides an effective and efficient system that is capable of managing even the most complex situation with a great degree of flexibility, control, and reliability.

## Advantages of the Incident Command System

**Expandability**--An all-hazards incident management system can be readily adapted to the incident. The ICS is expandable from routine to complex incidents. The person in charge, the Incident Commander (IC), may be an engine company lieutenant, captain, the chief of the department, a police officer, the commissioner, an advanced first aider, or a paramedic supervisor.

**Commonalities** in organization, terminology, procedures, and qualifications--The ICS provides a common framework under which different agencies and disciplines can function effectively during an emergency. Established roles and procedures also facilitate interorganizational communications and planning.

**Unified Command**--A key attribute of ICS is the unity of purpose and command available through shared and defined responsibilities.

## Single Versus Unified Command

In a single command situation, only one agency has legal responsibility.

Hazardous materials incidents, mass casualty incidents, natural disasters, or wildland fires, among others, may involve a number of jurisdictions and/or agencies that have a legal or functional need to be involved directly in the decisionmaking process. The worst thing that can happen is to allow each of these responsible agencies to establish a Command Post (CP) of its own, separate and distinct from the others. In this instance, it is critical that there be a Unified Command.

## What Cues the Need for a Unified Command?

- More than one agency responsible for decisionmaking within a single jurisdiction.

  Example: A passenger airline crash within a national forest. Local fire, local medical, Federal forestry, and National Transportation Safety Board (NTSB) are all involved.

- More than one jurisdiction is involved.

  Example: A major flood, hurricane, etc.

All agencies with responsibility to manage the incident contribute to the Command process. Together they determine overall incident objectives and strategies, and plan tactics jointly. This method ensures the maximum use of assigned resources.

- The location of the incident.

  Example: An inland waterway entirely within the boundaries of a single jurisdiction also could involve U.S. Fish and Wildlife Service and the U.S. Coast Guard (USCG).

## Who is Involved?

- All agencies with responsibility to manage the incident contribute to the Command process. Together they determine overall incident objectives, determine strategies, and plan tactics. This method ensures maximum use of assigned resources.

- One key official from each jurisdiction or responsible agency.

- Representatives from departments in a single jurisdiction.

The IC may be determined by local or State law; California law states that the law enforcement agency is the IC for haz mat incidents on the highways. Where there is no law determining who is in charge, agencies should work together to determine which agency takes the lead for each risk a community faces.

Generally, the agency with the greatest jurisdictional involvement is assigned the Operations function. Depending on the type of incident, someone must determine which agencies actually have responsibility. It is important to recognize prior training and experience when staffing the Unified Command Post and Operations function.

## Single/Unified Command Differences

- In Single Command structure, a single IC is solely responsible for management strategy of the incident.
- In a Single Command structure, the implementation of strategy and tactics to achieve operational control is the responsibility of one person--the Operations Section Chief.
- In a Unified Command structure, individuals designated by involved jurisdictions/departments jointly determine objectives, strategy, and priorities.
- The determination of which jurisdiction/agency the Operations Section Chief represents must be made by mutual agreement of the Unified Command.

## VIDEO: "OUT OF CHAOS"

The video "Out of Chaos" describes the purposes and benefits of using the ICS in all types of emergency operations, including hazardous materials response. As you watch the video, try to apply the concepts presented in the video to your own jurisdiction and responsibilities. Take notes in the space below.

## NOTES:

## INCIDENT COMMAND SYSTEM CONCEPTS AND TOOLS

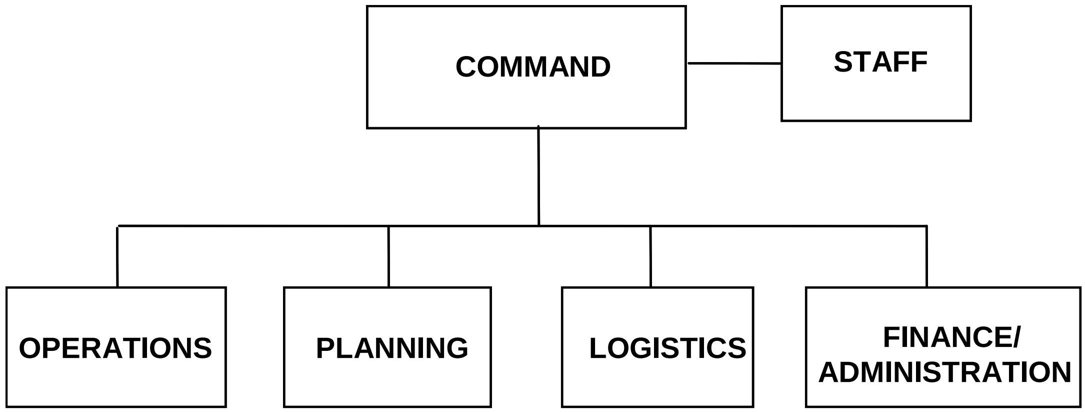


**Figure 6-1**
**Five Major Functions**

### Functions of the Incident Command System

Five major functions of the ICS are Command and Staff, Operations, Planning, Logistics, and Finance/Administration.

**Command:** The functions of Command include

- assume and announce Command, and establish an effective operating position (CP);
- rapidly evaluate the situation (sizeup);
- initiate, maintain, and control the communications process;
- identify the overall strategy;
- develop an Incident Action Plan (IAP);
- assign companies and personnel consistent with plans and SOP's;
- develop an effective incident command organization;
- provide tactical objectives;
- review, evaluate, and revise (as needed) the IAP;
- provide for the continuity, transfer, and termination of Command; and
- provide for safety and personnel accountability.

The IC is responsible for all these functions. As Command is transferred, so is the responsibility for the functions. The first five functions must be addressed immediately from the initial assumption of Command.

The IC implements the Command Staff and General Staff functions necessary to support the incident and retains responsibility for those functions not delegated.

The Command Staff includes the **Liaison Officer** who interfaces with all assisting agencies. The **Information Officer** handles information and media releases, and the **Safety Officer** monitors hazardous and unsafe situations and initiates actions to prevent unsafe acts.

**Operations** manages all activities directly applicable to the primary mission (fire suppression, rescue, Emergency Medical Services (EMS), scene control, etc.). The Operations Officer is a member of the General Staff and is responsible for allocating and assigning resources to accomplish control of the incident.

The Operations Section is responsible for the direct management of all incident tactical activities, tactical priorities, and the safety of personnel working in the Operations Section.

The most common reason for staffing Operations is to relieve the span-of-control problems for the IC. These span-of-control problems occur when the number of branches, divisions, and groups, coupled with Planning and/or Logistic Section elements, exceeds the IC's ability to manage effectively. The IC then may implement the Operations Section to reduce the span-of-control, transferring the direct management of all tactical activities to the Operations Section. The IC then is able to focus attention on the overall management of the entire incident as well as interact with the Command Staff and General Staff.

A complex incident, in which the IC needs assistance determining strategic goals and tactical objectives, also may require implementing Operations.

However, Operations should be staffed only to improve the management of the incident. If it is not used to maintain a manageable workload or an effective span-of-control, the IC could end up with a span-of-control of one.

After Operations is implemented, the duties of the IC are modified slightly. Operations will be responsible for all tactical operations, resources, and accomplishment of specific activities. The IC will be responsible for the development of the incident strategy and the communication of that strategy to the Operations Section Chief.

**Planning** collects and evaluates incident status information needed to understand the current situation, predict the course of the incident, and prepare control objectives and alternative strategies. The Planning Officer is a member of the General Staff and conducts a continuous evaluation of the incident.

**Logistics** provides facilities, supplies, and support. The Logistics Officer, a member of the General Staff, is in charge of communications, transportation, and medical and food services.

**Finance/Administration** is responsible for all financial records and cost analysis aspects of the incident. Responsibilities include future payments, budgeting, and cost recovery.

## Responder Rehabilitation

Responder rehab should be considered by the IC during the initial planning stages of an emergency response. However, the climatic or environmental conditions of the emergency scene should not be the sole justification for establishing responder rehab. Any activity/incident that is large in size, long in duration, and/or labor intensive will deplete the energy and strength of personnel rapidly, and therefore merits consideration for responder rehab.

A critical factor in the prevention of heat injury is the maintenance of water and electrolytes. Water must be replaced during exercise periods and at emergency incidents. During heat stress, the member should consume at least 1 quart of water per hour. The rehydration solution should be a 50/50 mixture of water and a commercially prepared activity beverage, administered at about 40°F (4.4°C). Avoid alcohol, caffeine, and carbonated beverages, as they interfere with the body's water conservation mechanisms.

Food should be provided at the scene of an extended incident of 3 or more hours' duration. A cup of stew, soup, or broth is highly recommended because it is digested much faster than sandwiches and fast food products. Avoid fatty and/or salty foods.

The "two air bottle rule," or 45 minutes of work time, is recommended as an acceptable level prior to mandatory rehabilitation. Members shall rehydrate (at least 8 ounces) while self-contained breathing apparatus (SCBA) cylinders are being changed. Firefighters, having worked for two full 30-minute-rated bottles, or 45 minutes, shall be placed immediately in responder rehab for rest and evaluation. Rest shall not be less than 10 minutes and may exceed an hour as determined by the responder rehab manager. Crews released from rehab shall be available in Staging to ensure that fatigued members are not required to return to duty before they are rested, evaluated, and released by the responder rehab manager.

Members in the rehab area should maintain a high level of hydration. Members should not be moved from a hot environment directly into an air-conditioned area, because the body's cooling system can shut down in response to the external cooling.

Emergency Medical Services (EMS) should be provided and staffed by the most highly trained and qualified EMS personnel on the scene (at a minimum of basic life support (BLS) level). The heart rate should be measured for 30 seconds as early as possible in the rest period. If the member's heart rate exceeds 110 beats per minute, an oral temperature should be taken. If the member's temperature exceeds 100.6°F (38°C), he/she should not be permitted to wear protective equipment. If it is below 100.6°F, and the heart rate remains above 110 beats per minute, **rehabilitation time should be increased.** All medical evaluations shall be recorded on standard forms along with the member's name and complaints; they must be signed, dated, and timed by the responder rehab manager or his/her designee.

Members assigned to responder rehab shall enter and exit as a crew. The crew designation, number of crew members, and the times of entry and exit from the responder rehab area shall be documented on the company's check-in/checkout sheet. Crews shall not leave the responder rehab area until authorized by the responder rehab manager.

## HEAT STRESS INDEX

**Relative Humidity**

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

NOTE: Add 10°F when protective clothing is worn, and add 10°F when in direct sunlight.

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

**Temperature °F**

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

| | Wind Chill Temperature °F | Danger |
|---|---|---|
| A | Above -25°F | Little danger for properly clothed person |
| B | -25°F/-75°F | Increasing danger, flesh may freeze |
| C | Below -75°F | Great danger, flesh may freeze in 30 seconds |

## REHAB UNIT   COMPANY CHECK-IN/OUT SHEET

## CREWS OPERATING ON THE SCENE:____________________________________

____________________________________________________________

| Unit # | # Persons | Time In | Time Out | | | Unit # | # Persons | Time In | Time Out |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
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## Unity of Command

The concept of Unified Command should not be confused with unity of command. **Unified Command** means shared responsibility for overall incident management at a multiagency or multijurisdictional incident. **Unity of command** indicates that each individual reports to only one supervisor.

Unity of command describes an organizational arrangement with a clear decisionmaking process and established authorities. The structure permits integrated and effective management of the incident. An established chain of command means everyone knows who is in charge and to whom they report.

## Span-of-Control

Span-of-control refers to the number of personnel reporting to any given individual. Optimum span-of-control in the ICS is five, with an acceptable spread of two to seven. On a situation that is not yet under control, no one operating under ICS should have more than five personnel reporting to him/her.

Span-of-control ratios can be driven by a number of factors:

- Training/Experience level of subordinates--Poorly trained or less experienced personnel require more direct supervision, thereby lessening the number of subordinates one can manage effectively.

- Complexity of the incident--A haz mat incident may require more mental concentration, thereby leaving less time available to supervise personnel.

- Type or timeframe of the incident--The speed of operations may influence span-of-control. A fast-moving incident may require a tighter span-of-control with fewer divisions/groups in place, whereas, in a slower moving operation such as overhaul, the supervisor is less pressed for time for decisionmaking and therefore can manage more personnel/divisions/groups.

For span-of-control purposes, these functions are not counted as reporting to a supervisor: Safety Officer, Liaison Officer, Information Officer, and Staging Area Manager. In the ICS, these positions are basically assistants to the IC, or in the case of Staging, to the Operations Section Chief.

Command officers must anticipate span-of-control problems and prepare for them, especially during the rapid buildup phase of an incident. Effective management is difficult to accomplish when too many people are reporting to one supervisor.

For example, a fire in a rather large building involves the majority of the structure. Other buildings surrounding the fire are threatened. These buildings are referred to as exposures. We need to protect the exposures, evacuate people from them, control the crowd and traffic in the area, treat any injured people or responders, etc.

In order to accomplish all of the necessary tasks in this incident, many responders will need different jobs (functions). Initially, a number of units and personnel respond to the incident scene. If command of the incident and scene is not established and maintained from the very early stages, this incident will turn into chaos. If units are not given specific assignments, they will assign themselves. This is known as **freelancing**, and is a sure sign that the incident is out of control.

Because so many things need to be done and so many individuals, crews, and units need to be directed, one individual would be rapidly overwhelmed. The incident is beyond the span of control of one individual. In order to maintain control, the IC must **delegate** command for various functions to other personnel. (This is what is meant by modular expansion.)

## Organizational Elements

One of the most effective ways to delegate command is to break the incident into smaller, more manageable pieces on the basis of functions to be performed and/or geographic locations for the functions. In the example given, personnel could be assigned geographically to a specific exposure, and functionally to EMS, scene control, rescue, and evacuation.

There are three major command elements used within the operations portion of the ICS: division, group, and branch.

### Division

A **division** is a geographic designation. For example, the units operating on the third floor of a building could be designated Division 3, those on the second floor Division 2, and so on.

### Group

A **group** designates a function that is not tied to one specific geographic location. For instance, EMS is a function that is not bound by a geographic location. The same holds true for rescue, evacuation, and so on.

### Functional Branch Structure

When the nature of the incident calls for a functional branch structure, e.g., a major aircraft crash within a jurisdiction, three departments within the jurisdiction (police, fire, and health service) may be organized into a functional branch structure operating under the direction of a single Operations Section Chief. In this example, the Operations Section Chief is from the fire department with branch directors from all three departments. Other alignments could be made depending upon the jurisdiction's plan and type of emergency. Note that Incident Command in this situation could be either Single Command or Unified Command, depending on the jurisdiction.

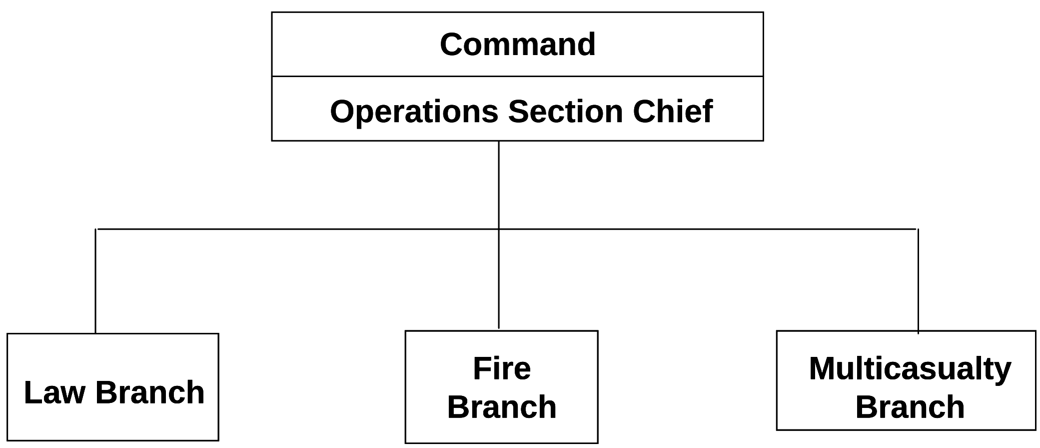



**Figure 6-2**
**Functional Branches**

**Multijurisdictional Incidents:** When the incident is multijurisdictional, resources are managed best under the agencies which have normal control over their local resources.

Branches should be used at incidents involving two or more distinctly different major management components (e.g., a large fire with a major evacuation; a large fire with a large number of patients). The IC may elect to assign branches to forward positions to manage and coordinate activities, as illustrated in Figure 6-3.

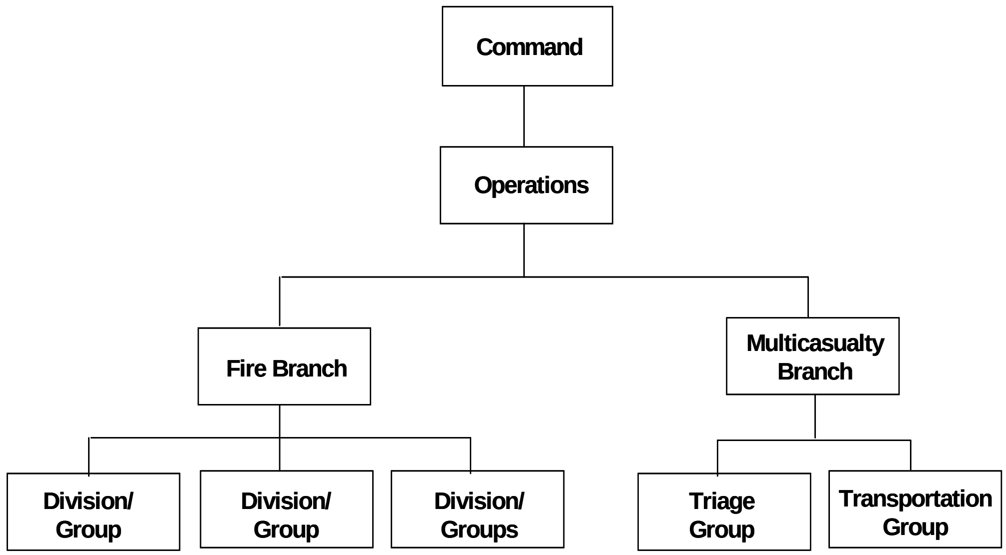



**Figure 6-3**
**Multibranch**

When the incident requires the use of aircraft, such as for the transportation of victims from a multicasualty incident, highrise rooftop rescue, swift water rescue, or wildland fire, the Operations Section Chief should establish the Air Operations organization. Its size, organization, and use will depend primarily on the nature of the incident and the availability of aircraft.

Air operations are complex operational elements. Air operations must be closely coordinated and fully understood by the IC and Operations Section supervisors. For more information, see Figure 6-4 and the Student Manual (SM) Appendix.

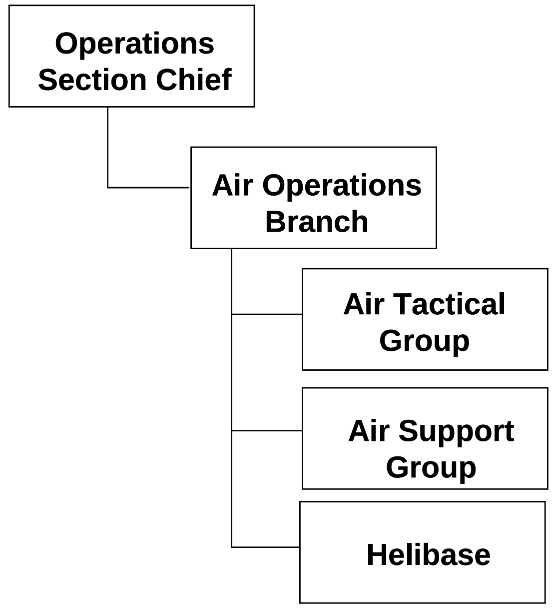



**Figure 6-4**
**Air Operations**

### Safety Officer

OSHA 29 CFR 1910.120 specifies that the IC shall designate a knowledgeable Safety Officer to ensure the safety of all persons on the scene. The Safety Officer is part of the IC's staff and can suspend or modify any activity that is deemed to be an immediate hazard to personnel. If this step is taken, the IC must be informed immediately.

In smaller incidents this role may be performed by the IC or delegated to another person. But, even though every incident must have someone serving as the Safety Officer, it is important to remember that **safety** is **everyone's responsibility** at a hazardous materials incident scene.

### The Role of the First Responder in the Incident Command System

A first responder may become the IC if he/she is the initial person to arrive on the scene. The reason is really quite simple. Command of the incident **must** be established with the first-arriving unit.

The initial responder must **establish command** and ensure that the role of IC is performed, at least for the moment. At this point, the IC is responsible or must designate a responsible party to notify appropriate authorities that there is indeed a hazardous materials incident. Next, the first responder must take steps to gain control of the incident scene. Simply stated, the incident scene must be isolated, and entry into the area must be denied.

Upon the arrival of a more senior person or a representative of the lead agency, the initial responder may need to **transfer command**. This means the first responder is responsible for providing the incoming IC with **all** appropriate information regarding the incident and the specific actions that have been taken thus far.

At this point, the first responder would be relieved of command, but may very well be assigned another functional position. For example, a police officer may be assigned to a staging area (gathering point) for all incoming police or may take command of police activities until relieved.

In this type of situation, the first responder is going from the position of IC to an operational role. In other words, the responder is going from command of the entire incident to the operations function where a subcommand or specific operations role will be fulfilled.

## Incident Scene Accountability

All officers holding positions within the Command organization are responsible for the welfare and accurate accountability of all assigned firefighters. Several fireground accountability systems have been developed by various fire departments around the country. While these may vary in overall design, there are common elements of personnel accountability that fire departments should apply at emergency incidents to account for their personnel fully. These common elements are

- required use;
- hardware--nametags/documentation;
- point-of-entry control of nametags;
- accountability officers;
- benchmarks for required rollcalls throughout operations;
- plans for describing the Command organization response to reports of lost firefighters; and
- use of Rapid Intervention Crews (RIC's).

Whatever the design, the system must be able to locate every firefighter within a small geographic work area within the hazard zone at any moment in time. Further, the system must be able to determine if a firefighter is delayed from an assignment, initiate an immediate rescue effort, if indicated, and fully integrate into the ICS. **All fire departments**

**are strongly encouraged to develop and implement a workable accountability system for their department.** The final product should be compatible with metro-area or regional accountability systems.

### Back-up/Rapid Intervention Crew

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, requires the presence of specifically designated rescue crews at the incident scene. This requirement is based on the realization that firefighters are exposed to the highest risk of injury or death while operating at the scene of an emergency, and that one of the most effective mechanisms for reducing that risk is to have a Rapid Intervention Crew (RIC) ready to come to the assistance of emergency personnel should the need arise.

One of our primary concerns should be to reduce the risks that firefighters are exposed to during emergency operations. It is not realistic, however, to assume that all the risks can be avoided, controlled, or eliminated from the firefighter's environment. Danger is part of our work environment, and the possibility that things can go wrong always must be a consideration. Recognizing this possibility, we must make some provisions to assist members who find themselves in trouble.

The risk may be increased by the nature of the task in which firefighters are involved. Rescuing an unconscious worker form a confined space that is filled with toxic and flammable vapor is much more dangerous to rescuers than removing an unconscious person from a wrecked automobile on a city street. Both situations involve a degree of risk to the rescuers, but the nature and degree of the risks are very different.

In a hazardous materials operation, the entry team leader must ensure that there is an RIC of at least two personnel in the appropriate level of protection before the primary entry team accesses the hot zone. In a hazardous materials operation, this team is designated as the backup team. The personnel of the backup team need to have the same level of required technical competency as the entry team. This includes the appropriate level of protection required for the material(s) involved.

While there is some flexibility in procedural issues regarding rapid intervention, it is paramount that whenever personnel are operating in positions or performing functions that would subject them to immediate danger in the event of equipment failure or other unexpected sudden event, at least one properly attired RIC must be available to provide assistance or rescue.

## Activity 6.1

## Vehicle Accident

### Purpose

To show how the ICS can be adapted to an incident.

### Directions

1. Your instructor will use the scenario to explain how an incident can be broken into modules. This will help clarify the concept of modular expansion.

2. Answer the questions on the following Worksheet, and contribute your answers to a large group discussion.

3. Where possible, use relevant concepts--span-of-control, unity of command, SOP's, Safety Officer.

## Activity 6.1 (cont'd)

## Worksheet

### Scenario

There has been a head-on two-vehicle accident. Two people are trapped, one in each vehicle. Altogether there are five injuries, including the two trapped victims. You are the first-arriving unit.

1. What broad tasks/categories must be performed (e.g., ventilation, crowd control, etc.)?

    ____________________________________________________________

    ____________________________________________________________

    ____________________________________________________________

2. What resources are needed to perform these tasks?

    ____________________________________________________________

    ____________________________________________________________

    ____________________________________________________________

3. How could these resources be managed through an ICS? (If desired, use a diagram to show command structure.)

    ____________________________________________________________

    ____________________________________________________________

    ____________________________________________________________

## INCIDENT LEVELS

Emergency situations come in all sizes ranging from small to extremely large. As the size of the incident increases, so does the need for personnel, resources, notifications, time expenditures, etc. For this reason, establishment of a relatively uniform set of incident level designations can assist emergency responders greatly in predetermining the needs of the incident.

Incident leveling systems are used in many types of emergency response situations:

- Emergency medical services identify various levels of disasters based on the number of victims and the severity of the injuries.
- The fire service uses alarms to request more personnel and resources and to identify specific notification needs.
- Nuclear power facilities use four levels of emergencies depending on the severity of the problem.

All of these systems have one thing in common: they tell others within the response system, at least to a degree, what to expect. They provide specific predesignated information about the incident and proper responses, including magnitude, complexity, notification, resource needs, staffing requirements, etc.

No specific number of levels is required. Some sources such as the National Fire Protection Association (NFPA) Standard 471, *Recommended Practice for Responding to Hazardous Materials Incidents,* list three, while other sources list four. Whatever system is chosen is basically up to the locality. The following provides one example of an incident leveling system.

### Level I

Level I is a **routine emergency condition**. Such situations normally can be controlled by first responders due to the small magnitude of the incident and the minimal degree of the hazard. No evacuation is indicated other than the isolation of the immediate incident area. The incident is confined to a small geographic area. Full protective equipment (turnouts) is adequate for response.

Organizations typically involved could include a fire brigade, fire department, security, law enforcement, EMS, the Chemical Transportation Emergency Center (CHEMTREC), State environmental agency, or others.

### Level II

Level II is a **limited emergency condition**. Such situations pose a potential threat to life and the environment. This is a more serious situation with a greater quantity or higher degree of hazardous substance involved. Normally this type of situation may involve a limited evacuation.

Agencies involved might include those listed in Level I plus a haz mat team, Red Cross, emergency management, health department, public works, State police, public utilities, National Response Center (NRC), etc.

### Level III

Level III is a **large-scale emergency condition.** Such situations pose a major threat to life, property, and/or the environment. The incident involves a relatively large quantity of an extremely hazardous substance, a high degree of toxicity, the potential for major fire and/or explosions, or potential for a large area to be affected. Many people must be evacuated.

The agencies involved might include those listed in Levels I and II plus mutual-aid fire and police department and EMS. State agencies such as emergency management, department of health and environmental protection, State police, and so on, also could become involved.

A Level III incident may involve the activation of local and State Emergency Operation Centers (EOC's). Agencies that could be involved would be all of those listed in Levels I, II, above plus Federal agencies such as EPA, USCG, FEMA, and the FBI, dependent upon incident severity. Direct onscene involvement of the National Response Team (NRT) and the Regional Response Team (RRT) through a designated EPA or USCG Federal Onscene Coordinator (OSC) may occur. Such incidents have the potential to strip the immediate area of all available emergency response capabilities in a relatively short period of time.

Planning charts for incident levels from NFPA 471 and other locally used guidance are located in Appendix B of this manual.

## Activity 6.2

## Paint Shop Incident

### Purpose

To identify actions to be taken by the first responder at a haz mat incident.

### Directions

1. Your instructor will divide the class into pairs.

2. Spend 5 to 10 minutes answering the questions on the following SAW for the scenario given. Be prepared to discuss your answers.

## Activity 6.2 (cont'd)

## Worksheet

### Scenario

You are the first responder to arrive at the following incident scene:

At a local paint shop loading dock, a 55-gallon drum fell from the rear of a delivery truck. It is leaking from a toothpick-sized hole in the bottom. There is a small pool of product forming and you can see a fizzing reaction taking place. It is 0945 on a Monday in June.

With another student, answer the following questions:

1. Identify the types of potential personnel safety problems you may be facing.

   ______________________________________________

   ______________________________________________

   ______________________________________________

2. Identify the resources you need to notify.

   ______________________________________________

   ______________________________________________

   ______________________________________________

3. Indicate the probable incident level and give reasons for your answer.

   ______________________________________________

   ______________________________________________

   ______________________________________________

4. Identify the actions to be taken by the first responder.

   ______________________________________________

   ______________________________________________

   ______________________________________________

## SCENE SETUP

A basic approach used for the protection of responders and the public at hazardous materials incidents involves the establishment of **zones** and **perimeters**. These designated areas are designed to help responders deny entry into the hazard area and initiate evacuation.

A zone is a defined area whose perimeter is its outer boundary. This principle is common in emergency response; other examples include collapse zones (firefighting) and line-of-fire zones (law enforcement). In both cases, zones are designed to protect responders and others.

The basic approach for setting up hazardous materials zones and perimeters is to establish three distinct areas of diminishing hazard: the hot, warm, and cold zones.

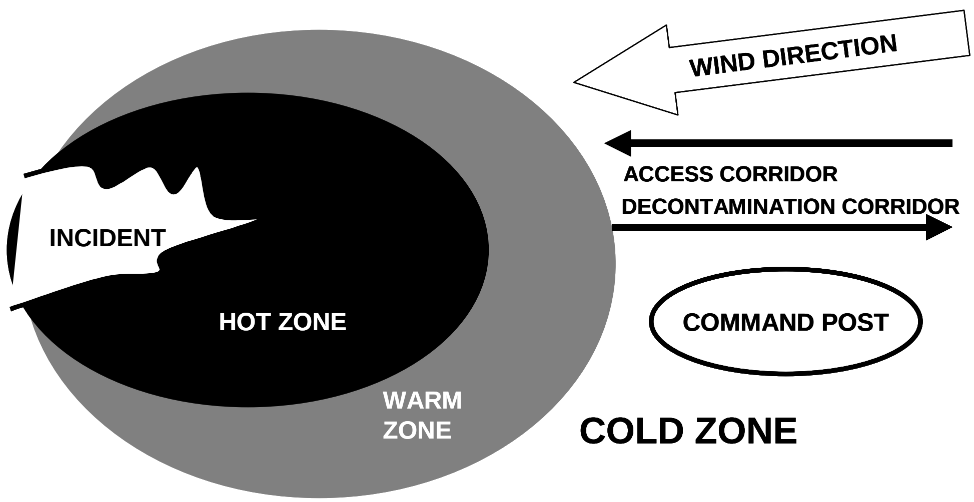



**Figure 6-5**
**Basic Scene Setup**

### Hot Zone

The hot zone has the highest degree of hazard. This zone is closest to the actual incident location and must be considered by first responders as extremely dangerous and possibly life threatening. Everything and everyone currently in or later entering the hot zone is considered to be contaminated. Everything and everyone contaminated must be **decontaminated** before leaving.

Six primary potential hazards are found in the hot zone. The acronym TRACEMP is used to help you remember these six hazards.

**T**hermal--both hot and cold situations.
**R**adiation--alpha, beta, and gamma.
**A**sphyxiation--oxygen deficiency.
**C**hemical--reactivity, corrosion, etc.
**E**tiologic--disease causing agents/biohazards.
**M**echanical--impact, falls, crushing, etc.
**P**sychological-difficulty in dealing with critical incident stress debriefing (CISD) issues.

Any combination of these hazards can be found in the hot zone. For this reason, **only personnel with the appropriate equipment and training can enter this zone**. Persons at the first responder-awareness level do not have the equipment or the training to enter this zone!!

### Warm Zone

The warm zone is an intermediate zone between the hot (very dangerous) and cold (relatively safe) zones. This zone contains the access points and decontamination corridor through which more highly trained and equipped personnel will enter the hot zone.

Although a lesser degree of hazard is associated with the warm zone, specific levels of knowledge and protection are needed by anyone entering this area. Since the decontamination corridor will become contaminated to some degree where more highly trained and equipped personnel enter the hot zone, first responders without adequate training and equipment **shall not enter the warm zone either**!

### Cold Zone

The cold zone is the area that should contain no hazards related to the chemicals involved. This **does not** mean that there are no hazards present, because, after all, this **is** an emergency scene. The cold zone is where the IC and staff locate their CP. However, the CP **must not** be directly next to the warm zone perimeter due to the activity that will be present at that location.

## PUBLIC PROTECTION OPTIONS

Two basic strategies exist for protecting the public in a hazardous materials incident: evacuation and sheltering in-place. Each has advantages and disadvantages.

### Evacuation

Evacuation is the physical relocation of people threatened by the incident. There are two phases of evacuation, initial and secondary.

**Initial evacuation**, sometimes called initial isolation, is the first movement of people in potentially imminent danger resulting from the incident. The first responder **may** be able to initiate such an evacuation **if** it can be done safely without entering the perimeter (hot or warm zones). Using a bullhorn or PA system and telling people to leave the immediate area often accomplishes initial evacuation. This may be the only evacuation needed.

People who are evacuated in this fashion **must be kept from leaving the scene**. They may need to undergo decontamination; **they should not be touched because of the potential for cross-contamination**. They may also provide vital information about the incident. As such, they should be treated like witnesses.

**Secondary evacuation** includes subsequent activities necessary in certain incidents to evacuate the public. Normally, the need for this step will be determined by someone other than a first responder. However, it may be the role of the first responder to carry out the secondary and any additional evacuations.

### Sheltering In-Place

Sheltering in-place is keeping threatened people in the same location (shelter) without moving them. This public protection option is appropriate when evacuation would cause people to be exposed to hazardous atmospheres. A crucial requirement involves "buttoning up" any openings in the shelter to minimize or stop the infiltration of the hazardous atmosphere. This includes the shutdown of air handling systems and air conditioners.

Some situations that **may** be appropriate for sheltering in-place are the protection of:

- disabled persons;
- critically ill persons;
- critical service personnel (jobs that they **cannot** leave); and
- prisoners.

Situations where sheltering in-place is not appropriate:

- the threat of fire, especially if it may occur over a large area;
- the threat of explosion, especially if it could affect a large area; and
- a situation that could produce a long-term release of a gas or highly volatile liquid.

In any event, determining whether to use evacuation or sheltering in-place is not easy, and the process of performing either is difficult.

# Activity 6.3

## Tank Truck Incident

### Purpose

To use the DOTNAERG to extrapolate information about a haz mat incident.

### Directions

1. The class will be divided into groups of four to six students.

2. This activity requires each group to use its DOTNAERG.

3. From the information supplied in the scenario, the material covered in class, and the DOTNAERG, fill out the Worksheet on the next page. Be prepared to discuss your answers with the class.

## Activity 6.3 (cont'd)

## Worksheet

### Scenario

You are the first-arriving unit to report of a downed person at the Academy Way Truck Terminal. You find a worker who was offloading a tank truck lying unconscious in a pool of liquid. The tanker has a red placard with the number 2534 on it. The liquid continues to flow from a ruptured hoseline.

It is 2330 hours on a Friday in October. The temperature is 60°F (16°C) with a 5-to-10 mph wind coming from the west. The relative humidity is 73 percent.

Directly to the east of the trucking terminal (100 feet) is a residential neighborhood.

## Activity 6.3 (cont'd)

## Tank Truck Incident Worksheet

1. UN ID number. ____________________________________________

2. Substance involved. ____________________________________________

3. DOT-ERG number. ____________________________________________

4. What are the hazards?

   Thermal: ____________________________________________

   Radiation: ____________________________________________

   Asphyxiation: ____________________________________________

   Chemical: ____________________________________________

   Etiologic: ____________________________________________

   Mechanical: ____________________________________________

5. Incident level: ____________________________________________

6. What are responder/public protection considerations?

   Perimeter/Zones distances: ____________________________________________

   ____________________________________________

   Evacuation: ____________________________________________

   ____________________________________________

   Shelter in place: ____________________________________________

   ____________________________________________

   Victim: ____________________________________________

   ____________________________________________

7. Is a haz mat team needed? ____________________________________________

   Why or why not? ____________________________________________

# APPENDIX

Slide 6-1

**UNIT 6:**
**SITE MANAGEMENT AND SCENE SETUP**

Slide 6-1

Slide 6-2

## TERMINAL OBJECTIVE

**The students will be able to identify the advantages and implications of basic concepts and procedures used in hazardous materials site management and scene setup.**

Slide 6-2

Slide 6-3

## ENABLING OBJECTIVES

**The students will:**

- **Describe the purpose of the Incident Command System (ICS) in hazardous materials response.**
- **Describe the role of the first responder in the ICS.**
- **Identify the advantages of using incident levels.**

Slide 6-3

Slide 6-4

## ENABLING OBJECTIVES (cont'd)

- Identify the three incident zones.
- Identify six personal hazards that may be associated with each of the three zones.
- Identify specific personal protective equipment (PPE) requirements for each of the three zones.

Slide 6-4

Slide 6-5

## HISTORY OF THE INCIDENT COMMAND SYSTEM

- Development of improved interagency incident management system
- Devastating wildland fires in Southern California in early 1970's
- Examining various aspects concerning interagency response to incidents

Slide 6-5

Slide 6-6

## FIRESCOPE

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

Slide 6-6

Slide 6-7

### NATIONAL INTER-AGENCY INCIDENT MANAGEMENT SYSTEM

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

Slide 6-7

Slide 6-8

### NEED FOR A SINGLEINCIDENT COMMAND SYSTEM

- **Inconsistencies**
- **Effective command**
- **Reduce confusion**

Slide 6-8

Slide 6-9

### NATIONAL FIRE SERVICE NCIDENT MANAGEMENT SYSTEM CONSORTIUM

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

Slide 6-9

Slide 6-10

## NATIONAL FIRE ACADEMY

- **Adopted FIRESCOPE ICS in 1980**
- **Incorporated material into its training curriculum**

Slide 6-10

Slide 6-11

## OTHER FIRESCOPE MODEL INCIDENT COMMAND SYSTEM APPLICATIONS

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

Slide 6-11

Slide 6-12

**Federal Emergency Management Agency formally adopted FIRESCOPE ICS as the incident management system for any Federal response.**

Slide 6-12

Slide 6-13

## ROLE OF THE INCIDENT COMMANDER

**"The senior emergency response official responding to a (chemical) emergency SHALL become the individual in charge (IC) of a site-specific incident command system (ICS)." (OSHA)**

Slide 6-13

Slide 6-14

## INCIDENT COMMAND SYSTEM IS A RESOURCE MANAGEMENT SYSTEM

**What is a system?**

Slide 6-14

Slide 6-15

## A SYSTEM

**Many individual components that form a single, functional unit.**

Slide 6-15

Slide 6-16

## THE INCIDENT COMMAND SYSTEM PROVIDES

- **Expandable organizational structures**
- **Common procedures and terminology**
- **Unified Command and purpose**

Slide 6-16

Slide 6-17

## OPERATIONAL RESPONSIBILITIES OF COMMAND INCLUDE THREE LEVELS

- **Strategic level--determines overall direction of the incident**
- **Tactical level--assigns operational (tactical) objectives**
- **Task level--completes specific tasks assigned to companies**

Slide 6-17

Slide 6-18

## STRATEGIC LEVEL

- **Function of the IC.**
- **IC sets the overall plan and strategic priorities.**

Slide 6-18

Slide 6-19

## TACTICAL LEVEL

- **Function of the Operations Section Chief.**
- **Operations selects tactical objectives and prioritizes the accomplishment of the objectives.**
- **When Operations Chief has not been designated, the IC must perform the tactical-level responsibilities.**

Slide 6-19

Slide 6-20

## TACTICAL LEVEL (cont'd)

- **When, and if, the Planning Section is established, the strategic and tactical levels of operation should become part of the information given to the Planning Section Chief.**
- **This is vital information for Planning, since the primary function of this section is evaluating the incident and forecasting incident needs.**
- **The Planning Section also must develop alternative plans that include both strategic-and tactical-level information.**

Slide 6-20

Slide 6-21

## TASK LEVEL

- **Function of the Company Officer (CO) and firefighters.**
- **Performing the individual tasks that achieve the tactical objectives.**

Slide 6-21

Slide 6-22

**VIDEO**
**"OUT OF CHAOS"**

Slide 6-22

Slide 6-23

**FUNCTIONS OF THE INCIDENT COMMAND SYSTEM**

Slide 6-23

Slide 6-24

**FUNCTIONS OF COMMAND**

- **Assume and announce Command and establish an effective operating position (Command Post)**
- **Rapidly evaluate the situation (sizeup)**
- **Initiate, maintain, and control the communications process**
- **Identify the overall strategy**
- **Develop an effective Incident Command organization**

Slide 6-24

Slide 6-25

## FUNCTIONS OF COMMAND (cont'd)

- **Provide tactical objectives**
- **Review, evaluate, and revise (as needed) the incident action plan (IAP)**
- **Provide for the continuity, transfer, and termination of command**
- **Provide for safety and personnel accountability**

Slide 6-25

Slide 6-26

**As Command is transferred, so is the responsibility for the functions.**

Slide 6-26

Slide 6-27

## THE FIRST FIVE FUNCTIONS MUST BE ADDRESSED IMMEDIATELY FROM THE INITIAL ASSUMPTION OF COMMAND

- **Assume and announce Command and establish an effective operating position (Command Post)**
- **Rapidly evaluate the situation (sizeup)**
- **Initiate, maintain, and control the communications process**
- **Identify the overall strategy**
- **Develop an effective Incident Command organization**

Slide 6-27

Slide 6-28

## STAFFING OPERATIONS

**The Operations Section is responsible for the direct management of:**

- **All incident tactical activities**
- **Tactical priorities**
- **The safety of personnel working in the Operations Section**

Slide 6-28

Slide 6-29

## REASON FOR STAFFING OPERATIONS

- **Span-of-control problems for the IC.**
- **Allows IC to focus attention on the overall management of the entire incident as well as interact with the Command Staff and General Staff.**
- **Operations assists the IC in determining strategic goals and tactical objectives.**

Slide 6-29

Slide 6-30

**Operations should be staffed only to improve the management of the incident.**

Slide 6-30

Slide 6-31

**AFTER OPERATIONS IS IMPLEMENTED, THE DUTIES OF THE INCIDENT COMMANDER ARE MODIFIED SLIGHTLY**

- **Operations will be responsible for all tactical operations, resources, and accomplishments of specific activities.**
- **IC will be responsible for development of the incident strategy and the communication of that strategy to the Operations Section Chief.**

Slide 6-31

Slide 6-32

**UNITY OF COMMAND**

- **Establishes authorities**
- **Involves a defined decisionmaking process**

Slide 6-32

Slide 6-33

**SPAN-OF-CONTROL**

- **Refers to the number of personnel who are reporting to any given individual.**
- **Optimum ICS is five.**
- **Acceptable spread of two to seven.**

Slide 6-33

Slide 6-34

## RATIOS CAN BE DRIVEN BY A NUMBER OF FACTORS

- **Training/Experience level of subordinates**
- **Complexity of the incident**
- **Type of incident or timeframe of the incident**

Slide 6-34

Slide 6-35

## FOR SPAN-OF-CONTROL PURPOSES, THE FOLLOWING FUNCTIONS ARE NOT COUNTED:

- **Safety Officer**
- **Liaison Officer**
- **Information Officer**
- **Staging Area Manager**

Slide 6-35

Slide 6-36

## ICS UNITS

- **Divisions**
- **Groups**
- **Branches**

Slide 6-36

Slide 6-37

**Consideration must be given to the number of resources and standard operating procedures (SOP's).**

Slide 6-37

Slide 6-38

**The IC shall designate a knowledgeable Safety Officer to identify and evaluate hazards to personnel.**

Slide 6-38

Slide 6-39

**First responder personnel are required to implement the ICS at a hazardous materials incident.**

Slide 6-39

Slide 6-40

## TRANSFER OF COMMAND

- **Improve quality of the command organization.**
- **Procedures/Guidelines must be predetermined by individual agencies.**
- **Methods of transferring command:**
  - **Face-to-face.**
  - **Radio.**
  - **Without an information exchange.**

Slide 6-40

Slide 6-41

## PASSING COMMAND

**Initial IC has three options of personal involvement at the incident:**

- **IC.**
- **Combat--hands-on.**
- **Tactically involved commander.**

Slide 6-41

Slide 6-42

## SELECT THE INCIDENT COMMANDER ROLE

- **When there are sufficient personnel to accomplish the initial high-priority tasks**
- **When the initial officer's involvement will not resolve a critical incident priority**

Slide 6-42

Slide 6-43

## SELECT THE COMBAT ROLE

- When the first-in officer's involvement will resolve a critical incident priority.
- When in the combat role, the first-in officer may pass command to the officer on the next arriving unit.

Slide 6-43

Slide 6-44

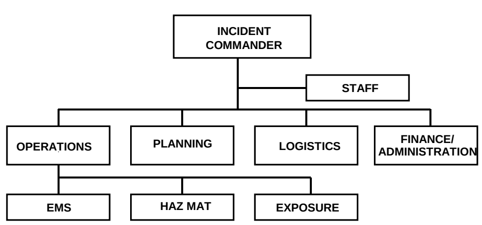
## SELECT TACTICAL ROLE

- Limited staffing
- Delayed response times
- Least desirable option

Slide 6-44

Slide 6-45

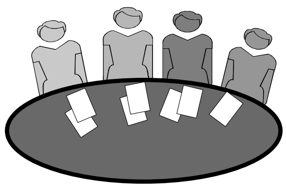
## ICS IS FUNCTIONALLY BASED




Slide 6-45

Slide 6-46

## Activity 6.1
## Vehicle Accident



Slide 6-46

Slide 6-47

## INCIDENT LEVELS

- **Useful to identify the incident magnitude**
- **Streamline emergency notifications**
- **Help identify needed resources**

Slide 6-47

Slide 6-48

## LEVEL I

- **Small, low-impact incident**
- **Small quantity of product**
- **Few resources needed**
- **Full turnouts appropriate**

Slide 6-48

Slide 6-49

## LEVEL II

- Greater magnitude
- Greater quantity of product
- Higher toxicity/vulnerability
- More resources needed
- Probably multiagency
- Limited evacuation

Slide 6-49

Slide 6-50

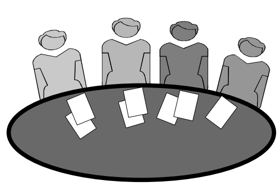
## LEVEL III

- Larger incident
- Multiagency/Resources
- Long duration
- Greater evacuation requirements

Slide 6-50

Slide 6-51

## Activity 6.2
## Paint Shop Incident



Slide 6-51

Slide 6-52

## SCENE SETUP

- **Zones**
- **Perimeters**
- **Denial of entry**
- **Evacuation**

Slide 6-52

Slide 6-53

**Personnel who enter the hazard zone of a hazardous materials incident are in the same imminent danger as those who enter a collapse or line-of-fire zone.**

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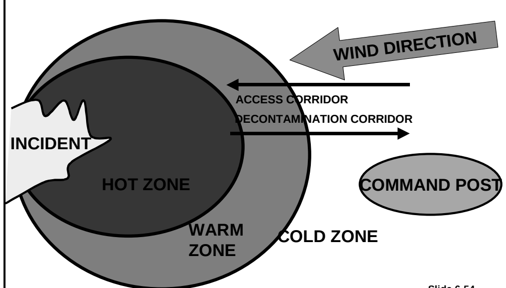
Slide 6-54

## BASIC SCENE SETUP




Slide 6-54

Slide 6-55

**THE HOT ZONE**

- **Most dangerous!**
- **Everything and everyone within are considered contaminated.**
- **First responder personnel without appropriate equipment and training SHALL NOT ENTER!**

Slide 6-55

Slide 6-56

**TRACEMP**

- **Thermal--heat or cold**
- **Radiation--ionizing particles or energy**
- **Asphyxiation--oxygen deficiency**

Slide 6-56

Slide 6-57

**TRACEMP (cont'd)**

- **Chemical--toxic substances, reactives, etc.**
- **Etiological--biohazard, disease-causing agents**
- **Mechanical--falling objects, shrapnel, etc.**
- **Psychological--stress in dealing with critical incident stress debriefing (CISD) issues**

Slide 6-57

Slide 6-58

**Personnel who enter a "hot zone" need appropriate levels of protective equipment and training.**

Slide 6-58

Slide 6-59

**THE WARM ZONE**

- **Presents a lesser degree of hazard**
- **Contains decontamination and access corridors**
- **Requires appropriate training and protective equipment**

Slide 6-59

Slide 6-60

**THE COLD ZONE**

- **Is a safe zone**
- **Should have no chemical hazard**
- **Is the location of the Command Post (CP)**

Slide 6-60

Slide 6-61

## PUBLIC PROTECTION OPTIONS

- **Evacuation**
- **Shelter-in-place**

Slide 6-61

Slide 6-62

## EVACUATION

**The physical relocation of people who are threatened by the incident:**

- **Initial**
- **Secondary**

Slide 6-62

Slide 6-63

## INITIAL EVACUATION

- **The first movement of people in imminent danger**
- **May be the only evacuation required**

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Slide 6-64

## INITIAL EVACUATION (cont'd)

- **If safe, may be done by first responders.**
- **Evacuees may need decontamination.**

Slide 6-64

Slide 6-65

## SECONDARY EVACUATION

- **Follows the initial evacuation**
- **Commonly for people in the Warm Zone**
- **Should not require decontamination.**

Slide 6-65

Slide 6-66

## SHELTER-IN-PLACE

- **Close up (button up) the shelter**
- **Protect endangered people by maintaining them in place**

Slide 6-66

Slide 6-67

## REASONS TO SHELTER-IN-PLACE

- **Evacuation will expose people to a dangerous atmosphere.**
- **Disability, illness, and/or other problems preclude evacuation.**

Slide 6-67

Slide 6-68

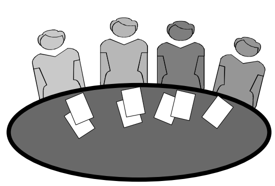
## REASONS NOT TO SHELTER-IN-PLACE

- **Threat of massive fire**
- **Threat of explosion**
- **Probable long duration of release**

Slide 6-68

Slide 6-69

## Activity 6.3
## Tank Truck Incident



Slide 6-69

Slide 6-70

## KEY POINTS

- **Federal regulations mandate that first responders use the ICS.**
- **Related ICS concepts are expandability, unity of command, span-of-control, and functional management.**
- **Zones and perimeters are used to deny access and facilitate evacuation.**
- **Public protection options include evacuation and sheltering-in-place.**

Slide 6-70

# *UNIT 7: PERSONAL PROTECTIVE EQUIPMENT*

### *TERMINAL OBJECTIVE*

*The students will be able to identify appropriate personal protective equipment (PPE) and its limitations for first responders.*

### *ENABLING OBJECTIVES*

*The students will:*

1. *List the three basic types of protection provided by haz mat PPE.*
2. *Describe the capabilities and limitations of the basic types of PPE.*
3. *Describe the appropriate use of PPE by first responders.*

## INTRODUCTION

Personal protective equipment (PPE) consists of special clothing and equipment worn by individual responders to protect themselves from potential hazards at an emergency scene. For the firefighter, this generally means turnout gear. Paramedics may think about latex gloves, splash protection, and adjunctive airway equipment. Police use firearms, nightsticks, and bulletproof vests. All are PPE for different purposes and situations.

PPE provides protection from three basic types of hazards:

- mechanical--physical protection;
- thermal--heat protection; and
- chemical--toxic corrosive protection.

Thermal and chemical protection can be further divided into body and respiratory protection, depending primarily on the type of material used and the availability of positive-pressure self-contained breathing apparatus (SCBA). The matrices on the next page summarize the protective capabilities of the major categories of PPE and chemical protective equipment (CPE) which are discussed below.

## CATEGORIES OF PERSONAL PROTECTIVE EQUIPMENT

### Structural Firefighting Equipment

PPE used by firefighters for structural firefighting is known as "bunker gear," "turnout gear," or by other names. Firefighters' PPE include a hood, helmet, coat, gloves, pants, boots, Personal Alert Safety System (PASS) device, and positive-pressure SCBA.

Turnout equipment is designed to cover the body and the respiratory system totally. It provides a high level of protection against physical injury and limited, short-term protection against heat and toxic atmospheres; it is not designed for direct fire entry. High levels of respiratory protection, both thermal and chemical, are provided by positive-pressure SCBA.

Any use of respiratory protective equipment **requires** that personnel receive an initial training program in its proper use, care, and handling. This training must include fit testing and subsequent certification of the user. The fit test ensures that the equipment does not leak. Additionally, there must be routine followup training and use of the equipment to maintain competency.

## Protective Capabilities of Personal Protective Equipment and Chemical Protective Equipment

### Thermal Protection

| PPE Type | Body | Respiratory |
|---|---|---|
| Full turnout equipment | Medium | High |
| Proximity suits | High | High |
| Entry suits | High | High |

### Chemical Protection

| CPE Type | Body | Respiratory |
|---|---|---|
| Level A | High | High |
| Level B | Medium | High |
| Level C | Low | Low |
| Level D | Low | None |

The standards for this equipment are spelled out in National Fire Protection Association (NFPA) 1500, *Standard on Fire Department Occupational Safety and Health Program* and 1581, *Standard on Fire Department Infection Control Program*. Training requirements are found in 29 Code of Federal Regulations (CFR) 1910 and NFPA 1500. An NFPA publication excerpt is included in Appendix C.

While "turnout gear" or "bunker gear" is intended for structural firefighting, it is not fireproof. It is not designed for fire entry. NFPA 1971, *Standard on Protective Ensemble For Structural Fire Fighting* states that structural firefighting equipment shall be capable of withstanding heat of 1,500ºF (816ºC) for 15 seconds. This means that in the event of high heat, as in a flashover, it will protect you for a short time while you get out.

## Proximity and Entry Suits

Thermal-resistant clothing and equipment includes proximity suits and entry suits. **Proximity (or approach) suits** are designed to withstand high temperatures for a limited period of time. It is important to note that these are **not** fireproof suits and are **not** designed for fire entry rescue. They are used for firefighting in areas primarily involving flammable or combustible liquids.

Proximity suits provide little body protection against mechanical and chemical injury, but high levels of thermal protection. Respiratory protection, both thermal and chemical, is high because of the use of positive-pressure SCBA.

**Entry suits** are designed to perform critical functions that require limited direct flame contact. Even these suits normally are limited in the amount of time direct flame contact is permitted--from 30 to 60 seconds **over the lifetime of the suit.**

Entry suits provide protection similar to proximity suits; however, thermal body protection is even higher. They provide a low level of body protection from chemicals, yet a high level of respiratory protection due to use of positive-pressure SCBA.

## Chemical Protective Equipment

**CPE** is special clothing designed to protect the wearer in chemical or toxic environments. The Environmental Protection Agency (EPA) has established four levels of protection: A, B, C, and D.

**Level A** is the highest level of chemical protection. A full coverage suit with positive-pressure SCBA inside or outside the suit is worn when there is danger of absorbing chemicals through the skin. However, this type of equipment provides virtually no mechanical or thermal body protection.

**Level B** protection provides increased body protection, usually in the form of a splash suit either designed in a one-piece full coverage garment or a two-piece design. A positive-pressure SCBA is required for respiratory protection. Special chemical gloves are used with Level B protection. Leather gloves should not be used since they absorb chemicals and cannot be decontaminated. Level B does not provide protection against chemicals that are absorbed through the skin, such as certain poisons.

**Level C** CPE provides limited body and respiratory protection. Body protection is in the form of overalls or splash suits. Respiratory protection is in the form of an air-purifying respirator, which is ineffective in many atmospheres and should **not** be used during the emergency response phase of an incident. Level C is not appropriate for the first responder.

**Level D** protective equipment is the level of least protection. It is generally work clothes without respiratory protection. As such, Level D provides some minimal mechanical, and even chemical protection, but no thermal or respiratory protection.

A wide variety of materials are used to manufacture CPE. Care must be taken when choosing the material for any level of CPE. Chemicals can attack and destroy CPE if the materials are not compatible with the chemicals on the scene. Before a suit is chosen, the chemical in question must be positively identified and its characteristics fully understood. **All** components of the CPE must be compatible with the chemical--not just the suit, but the gloves, boots, and facepiece.

Two questions need to be asked when CPE is needed: What is the appropriate level of protection (A, B, C, or D)? What material (neoprene, butyl rubber, Teflon®, etc.) should be used for the CPE? Assistance in this process can be obtained from Chemical Transportation Emergency Center (CHEMTREC) or the chemical manufacturer.

## LIMITATIONS OF PERSONAL PROTECTIVE EQUIPMENT

Several limitations must be considered when using all forms of PPE.

- Persons wearing PPE usually experience a **loss of physical dexterity and mobility**. A responder cannot move easily in protective clothing. The loss becomes more severe as the level of protection increases. To combat this problem the wearer must be well trained in the proper donning, wearing, and doffing of all PPE. Careful planning of the job at hand is also important. It may take much longer than anticipated if PPE are worn.

- Reduced dexterity and mobility also **increase stress**, both physical and mental. Careful monitoring of medical vital signs before and after use of PPE is critical. Total time in PPE also should be monitored closely. A rest and recuperation (R&R) area should be designated away from the scene, and time in the R&R area should be mandatory.

- Signs and symptoms of **heat stress** and possible **heat exhaustion** should be monitored. This should be done even if it is not a warm day. PPE can get very warm inside, because, as the hazardous environment is being kept out, body heat is being kept in.

  Heat stress results from the body's inability to cool itself through the normal perspiration and evaporation process. The four progressively serious levels of heat stress are heat rash, heat cramp, heat exhaustion, and heat stroke. Replenishment of body fluids is very important. Water or an electrolyte replenishment should be available.

- **Vision is limited** when PPE is worn. There is also a chance that facepieces may fog.

- **Communication is affected** when wearing SCBA and PPE because the facepiece obstructs the mouth.

It is very important for responders, especially those wearing PPE, to keep physically fit. Emergency response work is usually very difficult, and it is even more physically demanding when wearing PPE. NFPA 1500 provides guidance on establishing and maintaining a physical fitness program.

The care and maintenance of PPE is extremely important--a responder's life may depend on it. The care and maintenance program should include regular (daily, weekly, monthly, and yearly) inspections. Visual inspection often can catch a problem before it gets too big. Keeping the equipment clean and stored properly will help prevent damage.

Testing and recertification should be done to equipment manufacturers' specifications. Careful records should be kept on all maintenance and recertification activities. The person responsible for establishing such a program should consult the manufacturers for assistance. The program should be written down in the form of standard operating procedures (SOP's) and adhered to carefully.

## First Responder Uses of Haz Mat Personal Protective Equipment

In general, first responders will not have access to specialized thermal or chemical protective equipment. Use of this type of equipment requires special training, both in hazardous materials and in proper techniques for selection, maintenance, storage, and use. In short, first responders should not be using thermal or chemical protective equipment under any circumstances.

First responders generally will be in limited firefighting turnout gear or normal work clothes. At the first responder level, this equipment is adequate because these personnel should be acting primarily in a defensive mode. However, properly trained personnel may use turnouts for **limited** control activities.

## Activity 7.1

## Material Safety Data Sheet Data Retrieval

### Purpose

To identify information available on Material Safety Data Sheets (MSDS's)

### Directions

1. On the following Student Activity Worksheets (SAW's) are two new MSDS. Identify these specific data items from each of the forms.

2. Underline the answers on the MSDS form or take notes in the space below.

3. You have about 5 minutes to complete the activity. We will review the answers in class.

### MSDS 1

1. Material name: ____________________

2. Synonyms: ____________________

3. Flashpoints: ____________________

4. First-aid measures: ____________________

5. Personal protective equipment required: ____________________

6. Threshold limit value (TLV): ____________________

### MSDS 2

1. Material name: ____________________

2. Synonyms: ____________________

3. Flashpoints: ____________________

4. First-aid measures: ____________________

5. Personal protective equipment required: ____________________

6. Threshold limit value (TLV): ____________________

# MATERIAL SAFETY DATA SHEET

**MSDS NUMBER ➤** **51,161-5** **PAGE 1**

97367 (4-85)

| 24 HOUR EMERGENCY ASSISTANCE | | | GENERAL MSDS ASSISTANCE | BE SAFE<br>READ OUR PRODUCT SAFETY INFORMATION ... AND PASS IT ON<br>(PRODUCT LIABILITY LAW REQUIRES IT) |
|---|---|---|---|---|
| ACUTE HEALTH ✚ 3 | FIRE 4 | REACTIVITY 0 | ➤ LEAST - 0 SLIGHT - 1 MODERATE - 2 HIGH - 3 EXTREME 4 | |
| *For acute and chronic health effects refer to the discussion in Section III | | | | |

| SECTION I | NAME |
|---|---|
| PRODUCT ➤ | SU 2000(R) (SUPER UNLEADED GASOLINE) |
| CHEMICAL NAME ➤ | PETROL |
| CHEMICAL FAMILY ➤ | HYDROCARBON |
| SHELL CODE ➤ | 04352 |

| SECTION II-A<br>NO. | PRODUCT/INGREDIENT<br>COMPOSITION | CAS NUMBER | PERCENT |
|---|---|---|---|
| P | SU 2000(R) (SUPER UNLEADED GASOLINE) | MIXTURE | 100 |
| 1 | ALKANES, CYCLOALKANES, ALKENES AND AROMATIC HYDROCARBONS | MIXTURE | BALANCE |
| 2 | TOLUENE | 108-88-3 | 0-25.0 |
| 3 | XYLENE | 1330-20-7 | 0-25.0 |
| 4 | BENZENE | 71-43-2 | <5.0 |
| 5 | TERT-BUTYL METHYL ETHER | 1634-04-4 | 4.0-6.0 |

| SECTION II-B<br>NO. | ACUTE TOXICITY DATA<br>ACUTE ORAL LD50 | ACUTE DERMAL LD50 | ACUTE INHALATION LC50 |
|---|---|---|---|
| P | > 5 GM/KG (RAT) | >2 GM/KG (RABBIT) | >5 MG/L/4HR (RAT) |

SECTION III HEALTH INFORMATION

THE HEALTH EFFECTS NOTED BELOW ARE CONSISTENT WITH REQUIREMENTS UNDER THE OSHA HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200).

EYE CONTACT
BASED ON PRODUCT TESTING PRODUCT IS MODERATELY IRRITATING TO THE EYES.

SKIN CONTACT
PROLONGED AND REPEATED LIQUID CONTACT CAN CAUSE DEFATTING AND DRYING OF THE SKIN RESULTING IN SKIN IRRITATION AND DERMATITIS.

INHALATION
THIS PRODUCT MAY CAUSE IRRITATION TO THE NOSE, THROAT, AND RESPIRATORY TRACT AND ADDITIONALLY, MAY PRODUCE LIVER AND KIDNEY DAMAGE.

INGESTION
THIS PRODUCT MAY BE HARMFUL OR FATAL IF SWALLOWED. INGESTION OF PRODUCT MAY RESULT IN VOMITING, ASPIRATION (BREATHING) OF VOMIT INTO THE LUNGS MUST BE AVOIDED AS EVEN SMALL QUANTITIES MAY RESULT IN ASPIRATION PNEUMONITIS.

**PRODUCT NAME: SU 2000 (R) (SUPER UNLEADED GASOLINE)** **MSDS 51,151-5**
**PAGE 2**

SIGNS AND SYMPTOMS
IRRITATION AS NOTED ABOVE. EARLY TO MODERATE CNS (CENTRAL NERVOUS SYSTEM) DEPRESSION MAY BE EVIDENCED BY GIDDINESS, HEADACHE, DIZZINESS AND NAUSEA; IN EXTREME CASES, UNCONSCIOUSNESS AND DEATH MAY OCCUR. ASPIRATION PNEUMONITIS MAY BE EVIDENCED BY COUGHING, LABORED BREATHING AND CYANOSIS (BLUISH SKIN); IN SEVERE CASES DEATH MAY OCCUR. KIDNEY DAMAGE MAY BE EVIDENCED BY CHANGES IN URINE OUTPUT, URINE APPEARANCE OR EDEMA (SWELLING FROM FLUID RETENTION). LIVER DAMAGE MAY BE EVIDENCED BY LOSS OF APPETITE, JAUNDICE (YELLOWISH SKIN COLOR) AND SOMETIMES PAIN IN THE UPPER ABDOMEN ON THE RIGHT SIDE.

AGGRAVATED MEDICAL CONDITIONS
PREEXISTING EYE, SKIN, AND RESPIRATORY DISORDERS MAY BE AGGRAVATED BY EXPOSURE TO THIS PRODUCT. IMPAIRED LIVER AND KIDNEY FUNCTION(S) FROM PREEXISTING DISORDERS MAY BE AGGRAVATED BY EXPOSURE TO THIS PRODUCT.

OTHER HEALTH EFFECTS
IT HAS BEEN REPORTED THAT CHRONIC INHALATION EXPOSURE TO AN UNLEADED MOTOR GASOLINE, WHICH WAS FULLY VAPORIZED, HAS PRODUCED KIDNEY AND LIVER CANCERS IN SOME LABORATORY RODENTS. THE STUDIES WERE SPONSORED BY THE AMERICAN PETROLEUM INSTITUTE. THE API TEST MATERIAL USED WAS BLENDED TO REPRESENT A TYPICAL UNLEADED MOTOR GASOLINE.

SECTION IV OCCUPATIONAL EXPOSURE LIMITS

| | OSHA | | ACGIH | | OTHER |
|---|---|---|---|---|---|
| NO. | PEL/TWA | PEL/CEILING | TLV/TWA | TLV/STEL | |
| P | | | 300 PPM | 500 PPM | |

SECTION V EMERGENCY AND FIRST AID PROCEDURES

EYE CONTACT
FLUSH WITH WATER FOR 15 MINUTES WHILE HOLDING EYELIDS OPEN. GET MEDICAL ATTENTION.

SKIN CONTACT
FLUSH WITH WATER WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. FOLLOW BY WASHING WITH SOAP AND WATER. DO NOT REUSE CLOTHING OR SHOES UNTIL CLEANED. IF IRRITATION PERSISTS, GET MEDICAL ATTENTION.

INHALATION
REMOVE VICTIM TO FRESH AIR AND PROVIDE OXYGEN IF BREATHING IS DIFFICULT. GIVE ARTIFICIAL RESPIRATION IF NOT BREATHING. GET MEDICAL ATTENTION.

INGESTION
DO NOT INDUCE VOMITING. IF VOMITING OCCURS SPONTANEOUSLY KEEP HEAD BELOW HIPS TO PREVENT ASPIRATION OF LIQUID INTO THE LUNGS. GET MEDICAL ATTENTION.

NOTE TO PHYSICIAN
IF MORE THAN 2.0 ML PER KG HAS BEEN INGESTED AND VOMITING HAS NOT OCCURRED, EMESIS SHOULD BE INDUCED WITH MEDICAL SUPERVISION. KEEP VICTIM'S HEAD BELOW HIPS TO PREVENT ASPIRATION. IF SYMPTOMS SUCH AS LOSS OF GAG REFLEX, CONVULSIONS OR UNCONSCIOUSNESS OCCUR BEFORE EMESIS, GASTRIC LAVAGE USING A CUFFED ENDOTRACHEAL TUBE SHOULD BE CONSIDERED.

SECTION VI SUPPLEMENTAL HEALTH INFORMATION

A CHRONIC INHALATION STUDY (REFERENCED IN SECTION III) SUPPORTED BY THE AMERICAN PETROLEUM INSTITUTE FOUND THAT FULLY VAPORIZED UNLEADED GASOLINE EXPOSURE PRODUCED DOSE-RELATED INCIDENCES OF KIDNEY CANCER IN MALE RATS. GASOLINE EXPOSURE ALSO PRODUCED AN INCREASE OF LIVER CANCER AT HIGH DOSES (2056 PPM) IN FEMALE MICE. EXPOSURES WERE FOR 6 HRS/DAY, 5 DAYS/WEEK FOR A TOTAL OF 27 MONTHS. THE RELATIONSHIP AND SIGNIFICANCE TO MANY OF THE RESULTS OF THIS STUDY IS NOT KNOWN.

REPEATED HIGH LEVEL BENZENE EXPOSURE MAY PRODUCE INJURY OF THE BLOOD-FORMING TISSUES CAUSING BLOOD ABNORMALITIES AND POSSIBLY LEUKEMIA; HOWEVER, EXPOSURES TO SUCH HIGH LEVELS ARE NOT LIKELY TO BE ENCOUNTERED IN GASOLINE VAPOR DUE TO THE LOW BENZENE CONTENT.

INHALATION STUDIES ON GASOLINE VAPORS HAVE CAUSED CENTRAL NERVOUS SYSTEM EFFECTS IN DOGS AT 10,000 PPM.

UNLEADED GASOLINE WAS EVALUATED FOR GENETIC ACTIVITY IN ASSAYS USING MICROBIAL CELLS, CULTURED MAMMALIAN CELLS AND RAT BONE MARROW CELLS. THE RESULTS WERE ALL NEGATIVE. UNLEADED GASOLINE WAS CONSIDERED NON-MUTAGENIC UNDER THESE CONDITIONS.

THE HANDLING PROCEDURES AND SAFETY PRECAUTIONS IN THIS MSDS SHOULD BE FOLLOWED TO MINIMIZE EMPLOYEE EXPOSURE.

SECTION VII PHYSICAL DATA

| | | |
|---|---|---|
| BOILING POINT: 100-425 APPROX. (DEG F) | SPECIFIC GRAVITY: 0.72-0.76 ($H2O$ = 1) | VAPOR PRESSURE: 7-14.5 PSI (MM HG) (REID) |
| MELTING POINT: NOT AVAILABLE (DEG F) | SOLUBILITY: NEGLIGIBLE (IN WATER) | VAPOR DENSITY: 3.5 (AIR = 1) |
| EVAPORATION RATE (N-BUTYL ACETATE = 1): NOT AVAILABLE | | % VOLATILE BY VOL = 100 (@ 415 DEG. F) |

APPEARANCE AND ODOR: RED COLOR; CLEAN AND BRIGHT LIQUID. HYDROCARBON ODOR.

SECTION VIII FIRE AND EXPLOSION HAZARDS

FLASH POINT AND METHOD:
-40 DEG F TAG CLOSED TESTER

FLAMMABLE LIMITS /% VOLUME IN AIR
LOWER: 1.3 UPPER: 7.6

EXTINGUISHING MEDIA
USE WATER FOG, FOAM, DRY CHEMICAL OR CO2. DO NOT USE A DIRECT STREAM OF WATER. PRODUCT WILL FLOAT AND CAN BE REIGNITED ON SURFACE OF WATER.

SPECIAL FIRE FIGHTING PROCEDURES AND PRECAUTIONS
DANGER. EXTREMELY FLAMMABLE. CLEAR FIRE AREA OF UNPROTECTED PERSONNEL AND ISOLATE. DO NOT ENTER CONFINED FIRE SPACE WITHOUT FULL BUNKER GEAR INCLUDING A POSITIVE PRESSURE NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS. COOL FIRE EXPOSED CONTAINERS WITH WATER.

UNUSUAL FIRE AND EXPLOSION HAZARDS
VAPORS ARE HEAVIER THAN AIR ACCUMULATING IN LOW AREAS AND TRAVELING ALONG THE GROUND AWAY FROM THE HANDLING SITE. DO NOT WELD, HEAT OR DRILL ON OR NEAR CONTAINER. HOWEVER, IF EMERGENCY SITUATIONS REQUIRE DRILLING, ONLY TRAINED EMERGENCY PERSONNEL SHOULD DRILL.

SECTION IX REACTIVITY

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS AND MATERIALS TO AVOID:
AVOID HEAT, SPARKS, OPEN FLAMES, AND STRONG OXIDIZING AGENTS. PREVENT VAPOR ACCUMULATION.

HAZARDOUS DECOMPOSITION PRODUCTS
CARBON MONOXIDE AND OTHER UNIDENTIFIED ORGANIC COMPOUNDS CAN BE FORMED UPON COMBUSTION.

SECTION X EMPLOYEE PROTECTION

RESPIRATORY PROTECTION
UNDER CONDITIONS OF POTENTIAL HIGH EXPOSURE, THE USE OF A NIOSH-APPROVED RESPIRATOR IS RECOMMENDED (SEE SECTION X). PER 29 CFR 1910.134 USE EITHER AN ATMOSPHERE-SUPPLYING RESPIRATOR OR AN AIR-PURIFYING RESPIRATOR FOR ORGANIC VAPORS. FOR SERVICE STATION PERSONNEL PROTECTION, SEE SECTION XII.

# MATERIAL SAFETY DATA SHEET

(Approved by U.S. Department of Labor "Essentially Similar" to Form OSHA-20)

| | |
|---|---|
| **INFORMATION TELEPHONE NO:** | **REVISION DATE:** May 26, 1983 |

**EMERGENCY PHONE NUMBER** •This number is available days, nights, weekends, and holidays

## Section I - IDENTIFICATION

| | |
|---|---|
| **PRODUCT NAME** SUPEROX 702 | CHEMICAL NAME OR FAMILY Methyl Ethyl Ketone Peroxide (in solution with not more than 9% active oxygen |
| **FORMULA** Complex | **TRADENAME** SUPEROX 702 MEKP |
| **DOT SHIPPING NAME** Methyl Ethyl Ketone Peroxide, Organic Peroxide UN 2550 | **DOT HAZARD CLASS** Organic Peroxide |

## Section II - IMPORTANT COMPONENTS

| | **PERMISSABLE EXPOSURE CONCENTRATION** |
|---|---|
| Approx. 50% Methyl Ethyl Ketone Peroxides | Not Determined |
| Approx. 50% Dimethyl Phthalate | 5 ppm as airborne mist, 1970<br>$LD_{50}$: 1580 mg/kg mouse |

## Section III - PHYSICAL DATA

| | |
|---|---|
| **BOILING POINT (F)** | **SPECIFIC GRAVITY ($H_20$ = 1)** 1.16 |
| **VAPOR PRESSURE (mm Hg.)** not determined | **PERCENT VOLATILE BY VOLUME (%)** Negligible |
| **VAPOR DENSITY (AIR = 1)** Heavier than air | **EVAPORATION RATE** Slower than ether |
| **SOLUBILITY IN WATER** Negligible | |
| **APPEARANCE AND ODOR** Clear, colorless, slight odor | |

## Section IV - FIRE AND EXPLOSION HAZARD DATA

**FLAMMABILITY CLASSIFICATION** Class III Organic Peroxide **FLASH POINT** above 140°F (Setaflash) **LEL** NA

**EXTINGUISHING MEDIA** Water most effective, also water fog, carbon dioxide and dry chemical

**UNUSUAL FIRE AND EXPLOSION HAZARDS**

If confined in a rigid-walled container, could rupture violently.

**SPECIFIC FIREFIGHTING PROCEDURES**

Personnel evacuation primary. Blaze fought from a safe distance or from an explosion-protected location. Non-burning material should be relocated to a safe area as soon as possible. Water spray should be placed on all containers exposed to excess heat. Firefighters should wear self-contained breathing apparatus to avoid inhalation of smoke or vapors.

## Section V - HEALTH HAZARD DATA

**THRESHOLD LIMIT VALUE** None established for Methyl Ethyl Ketone Peroxide. See Section II. Dimethyl Phthalate, 5 ppm. as airborne mist, 1970.

**EFFECTS OF OVEREXPOSURE** Skin: Irritation and redness
Eyes: Severe irritation with possible permanent eye injury. If not promptly and thoroughly washed, can cause blindness.

**EMERGENCY AND FIRST AID PROCEDURES** Skin: Wash thoroughly with soap and water.
Eyes: Flush immediately with plenty of water for 15 minutes and seek medical attention.

## Section VI - REACTIVITY DATA

**STABILITY** ☒ **UNSTABLE** ☐ **STABLE** **CONDITIONS TO AVOID**

**INCOMPATIBILITY (*Materials to avoid*)** Metallic contamination, amines, organic metal salts, and strong oxidizing and reducing agents, mineral acids, alkalies, promoters or promoted resins.

**HAZARDOUS DECOMPOSITION PRODUCTS:**
Carbon monoxide and dioxide, dense smoke and intense heat, oxygen, and low molecular weight hydrocarbons.

**HAZARDOUS POLYMERIZATION** ☐ **MAY OCCUR** ☒ **WILL NOT OCCUR**

**CONDITIONS TO AVOID** Sunlight, heat above 100°F, open flame or sparks, contamination (see above), prolonged storage above 90°F.

## Section VII - SPILL OR LEAK PROCEDURES

**STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED**

Remove all sources of ignition and cover with non-combustible absorbent material to contain spillage. Expanded mica, dry sand or vermiculite are suitable. Gather absorbed mass with non-sparking tools to a clean polyethylene or polypropylene bag or container and move outdoors for disposal. Wash area with detergent and water. If material is not be disposed of soon, wet the contents of the bag thoroughly with water and seal the bag.

**WASTE DISPOSAL METHOD**

Absorbed waste may be burned in accordance with prevailing regulations. Ignition should be conducted from a safe distance and with extreme care.

## Section VIII - SPECIAL PROTECTION INFORMATION

**RESPIRATORY PROTECTION**
Should be worn to prevent inhalation of heated vapors or spray mist.

**VENTILATION**
General dilution or local exhaust ventilation.

**PROTECTIVE GLOVES** Chemical resistant polyethylene or non-soluble plastic.

**EYE PROTECTION** Use safety wear designed to protect against splash of liquids.

**OTHER PROTECTIVE EQUIPMENT** Safety showers and eye wash stations should be available.

## Section IX - SPECIAL PRECAUTIONS

**PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING** Store away from other materials in a cool place in original containers and away from any source of direct sunlight, heat, flame or sparks.

**OTHER PRECAUTIONS** Do not add to hot material and avoid all sources of contamination. Only glass, polypropylene, teflon, polythylene or ceramic containers, funnels or measuring devices should be used to avoid metal contamination during handling. When adding this material to a resin solution, promptly and thoroughly mix after addition is made. Never add promoters or promoted resins to MEKP. Consult label, SPI safety wall poster, and product.

# APPENDIX

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## TERMINAL OBJECTIVE

**The students will be able to identify appropriate personal protective equipment (PPE) and its limitations for first responders.**

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## ENABLING OBJECTIVES

**The students will:**

- **List three basic types of protection provided by haz mat PPE.**
- **Describe the capabilities and limitations of the basic types of PPE.**
- **Describe the appropriate use of PPE by first responders.**

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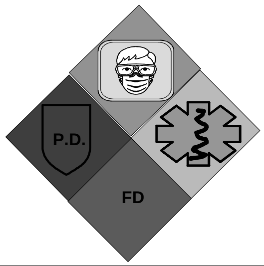
Slide 7-4

**PERSONAL PROTECTIVE EQUIPMENT--SPECIAL CLOTHING AND EQUIPMENT FOR PERSONAL PROTECTION**

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Slide 7-5

**CATEGORIES OF PERSONAL PROTECTION EQUIPMENT**

- **Mechanical: body**
- **Thermal: body, respiratory**
- **Chemical: body, respiratory**

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**FULL TURNOUTS (NFPA)**

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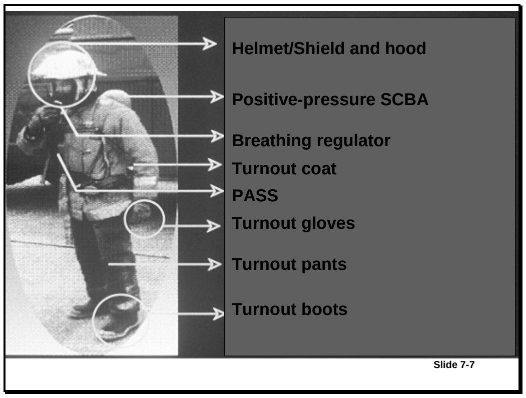


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## FULL TURNOUTS

- **Used for firefighting**
- **Not intended for chemical exposures**
- **Provide limited heat protection**

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## GENERAL RESPIRATORY PROTECTION REQUIREMENTS

- **Initial training**
- **Fit testing**
- **Routine followup training**

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**Types of Thermal Protection**

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**PROXIMITY SUIT (APPROACH)**

- **Limited duration exposure to heat 2,000ºF to 3,000ºF**
- **No direct flame contact**

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**ENTRY SUIT**

- **Limited duration exposure to heat**
- **30 to 60 seconds of direct flame contact over life of suit**

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**PROTECTIVE CAPABILITIES OF PERSONAL PROTECTIVE EQUIPMENT**

**THERMAL PROTECTION**

| PPE TYPE | BODY | RESPIRATORY |
|---|---|---|
| Full turnout equipment | Medium | High |
| Proximity suits | High | High |
| Entry suits | High | High |

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Slide 7-14

**LEVEL OF BODY PROTECTION FACTORS**

- **Hazards attributed to the product**
- **The specific incident condition**

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**TWO SIMILAR INCIDENTS COMPARED**

**Gasoline:**
**Turnouts are appropriate.**
**Fuming hydrochloric acid:**
**Turnouts are not appropriate.**

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## CHEMICAL PROTECTIVE EQUIPMENT

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## CHEMICAL PROTECTIVE EQUIPMENT (cont'd)

- **Level A**
- **Level B**
- **Level C**
- **Level D**

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## PROTECTION MATRIX

| CPE LEVEL | BODY PROTECTION | RESPIRATORY PROTECTION |
|---|---|---|
| LEVEL A | *HIGH* | *HIGH* |
| LEVEL B | | |
| LEVEL C | | |
| LEVEL D | | |

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## PROTECTION MATRIX (cont'd)

| CPE LEVEL | BODY PROTECTION | RESPIRATORY PROTECTION |
|---|---|---|
| LEVEL A | *HIGH* | *HIGH* |
| LEVEL B | *MEDIUM* | *HIGH* |
| LEVEL C | | |
| LEVEL D | | |

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## PROTECTION MATRIX (cont'd)

| CPE LEVEL | BODY PROTECTION | RESPIRATORY PROTECTION |
|---|---|---|
| LEVEL A | *HIGH* | *HIGH* |
| LEVEL B | *MEDIUM* | *HIGH* |
| LEVEL C | *LOW* | *LOW* |
| LEVEL D | | |

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## AIR-PURIFYING RESPIRATORS

- **Provide a very limited level of protection**
- **Are ineffective in some atmospheres:**
  - **Oxygen concentration below 19.5 percent**
  - **Contamination concentration above the designed maximum**
- **Are not for use during the emergency response phase of an incident**

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## PROTECTION MATRIX

| CPE LEVEL | BODY PROTECTION | RESPIRATORY PROTECTION |
|---|---|---|
| LEVEL A | ***HIGH*** | ***HIGH*** |
| LEVEL B | ***MEDIUM*** | ***HIGH*** |
| LEVEL C | ***LOW*** | ***LOW*** |
| LEVEL D | ***LOW*** | ***NONE*** |

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## PRIMARY LIMITATIONS OF PERSONAL PROTECTIVE EQUIPMENT

- **Heat stress**
- **Reduced mobility**
- **Limited vision**
- **Impaired communications**

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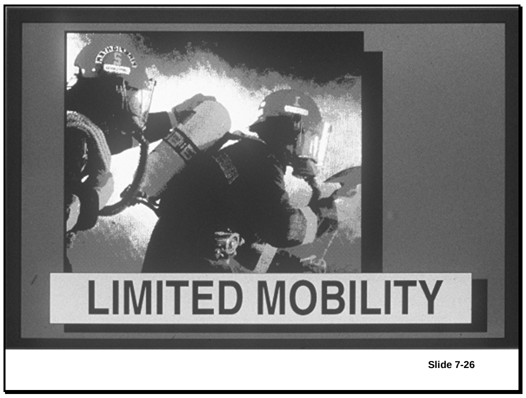


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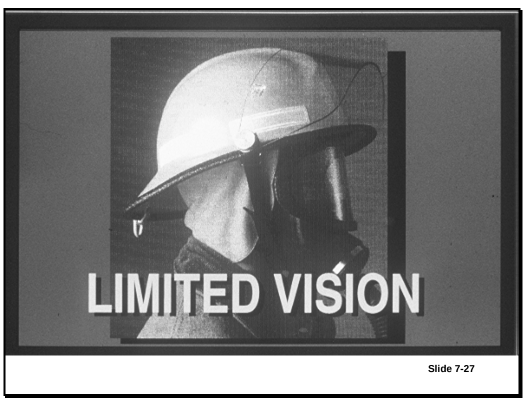

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**FIRST RESPONDERS SHOULD NOT NEED CHEMICAL OR SPECIAL PERSONAL PROTECTIVE EQUIPMENT**

- **Additional training is required.**
- **First responders operate primarily in a defensive mode.**

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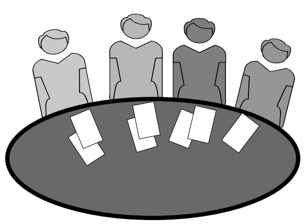
**Activity 7.1**
**Material Safety Data Sheet Data Retrieval**



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## KEY POINTS

- Hazardous materials PPE provides various levels of mechanical, thermal, and chemical protection.
- Types of PPE include structural firefighting equipment, thermal protection suits (proximity and entry suits), and CPE (Levels A to D).
- Limitations of PPE include heat stress, reduced mobility, limited vision, and impaired communications.
- First responders should not need thermal and CPE.

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# *UNIT 8: DECONTAMINATION*

### *TERMINAL OBJECTIVE*

*The students will be able to identify the role of the first responder regarding decontamination during hazardous materials incidents.*

### *ENABLING OBJECTIVES*

*The students will:*

1. *Describe the process of decontamination.*
2. *Explain the critical nature of decontamination for responders and victims.*
3. *Describe how cross-contamination occurs and the associated dangers.*
4. *Identify specific steps that must be taken to prevent contamination of responders and others.*

# WHAT IS DECONTAMINATION?

Several different definitions for decontamination are in widespread use today:

- **The Occupational Safety and Health Administration (OSHA)** defines decontamination as "the removal of hazardous substances from employees and their equipment, to the extent necessary, to preclude foreseeable health effects."

- **The National Fire Protection Association (NFPA)** defines decontamination as the "physical and/or chemical process of reducing or preventing the spread of contamination from persons and/or equipment."

When compared, both definitions address a slightly different focus and meaning of the term. For the purpose of this course, decontamination will be defined as a "**chemical or physical process used to remove and prevent the spread of contaminants from an emergency scene due to their ability to cause harm to living beings and/or the environment**."

In other words, decontamination is the process of removing or chemically changing a contaminant to prevent its spread and eliminate the possibility of exposure to others. A **contaminant** is any chemical or biological agent that is capable of causing harm to people, other forms of life, or the environment. The simple fact that a contaminant is capable of harming people and other living things is the exact reason why it must be removed from people or equipment.

## Concepts of Decontamination

Decontamination is likely to be required whenever chemicals are involved in an incident. This is true **even if contamination is not apparent**.

This raises an interesting question: "Must everyone on a haz mat incident scene undergo decontamination?" The answer is a **qualified no**! If the incident scene has been set up with zones following appropriate standard operating procedures (SOP's), and no one has entered the hot zone, there should be no need to decontaminate anyone.

Decontamination must be conducted if:

- The incident is not zoned appropriately.

- There has been a change in the incident status.

- Personnel have entered the hot zone.

- Victims were found in the hot zone.

Regarding decontamination, these fundamental points must be stressed

- **Anything or anyone entering the hot zone is considered to be contaminated and must be decontaminated before leaving that zone**. This includes responders, victims, onlookers, and equipment.

- **The best approach to decontamination is to PREVENT contamination in the first place.**

How is contamination prevented? By following established SOP's, including setting up zones, denying entry, and isolating the immediate area. By approaching from uphill and upwind and staying out of visible product. In fact, all responders should stay out of the hot zone completely unless adequately trained and appropriately equipped. Following these simple procedures can make a great difference in the magnitude of the decontamination problem.

## Methods of Contamination

During the initial response phase, emergency services personnel sometimes approach the scene from the wrong direction (from downhill or downwind) or approach too closely without realizing that the incident involves hazardous materials. They often demonstrate **tunnel vision** in their rush to aid a victim or to assess the situation. As a result, personnel, vehicles, and equipment become contaminated. The contamination may be the result of driving or walking through released toxic materials found on the ground or by breathing air contaminated by dusts, powders, gases, or vapors. At this point, the responder becomes the victim, frequently without even knowing it.

There are two ways in which responders can become contaminated: direct and cross-contamination.

**Direct contamination** occurs when a person or an object enters the hot zone (before or after it has been established officially) and comes into direct contact with the released substance (contaminant). Whenever personnel or bystanders come too close to the actual incident scene, the potential for direct contamination exists.

**Cross-contamination** is the result of contact with a contaminated person or object. Remember: **Cross-contamination, by definition, occurs whenever a victim, responder, or equipment that has been in the hot zone is touched prior to being decontaminated!**

It is vital not to underestimate the potential harm of cross-contamination. Many incidents have been compounded when contaminated victims were transported to medical facilities without undergoing decontamination. In those situations, the trail of cross-contamination led from the scene to the medic unit and its equipment, to the medics, to the emergency room and its equipment, and to emergency room personnel.

The impact can be staggering. Cross-contamination has led to the deaths of medics, emergency room personnel, and even emergency responders' family members. Those incidents escalated from a possibly small, easily managed situation to a large, complex, and tragic disaster with multiple victims.

The best way to prevent responder contamination is to follow the basic scene setup and control procedures outlined previously. Identify the level of incident involved, institute the incident command system, isolate and evacuate (where possible) the immediate area, request assistance, and provide information. **Remember, the best way to handle decontamination is to prevent contamination** in the first place.

## Phases of Decontamination

The decontamination procedures described below require specific training and expertise to perform. This particular discussion is **not to imply that first responders are capable of performing decontamination procedures**, nor to provide the necessary skills, but is designed to give an idea of what is involved in the **process**.

The decontamination process involves two specific phases:

1. Gross decontamination.

2. Secondary decontamination.

**Gross decontamination**, as the name implies, is the process of removing or chemically altering **gross** contaminants found on a person or object. Simply stated, gross contaminants are nothing more than the major portion of the contamination.

Most commonly, gross decontamination involves removal of **only** surface contaminants, and not necessarily all of the contaminations. This means that even after going through the process of gross decontamination, some amount of contamination will remain. This fact should make it obvious that a need exists for another round of decontamination, known as secondary decontamination.

**Secondary decontamination** is the removal or chemical altering of **most if not all of the residual contaminant** left on the person or object. Again, this implies that before undergoing secondary decontamination, some contamination still is present.

In any event, the two phases of decontamination apply to both people and equipment. It is vital to remember that if people or equipment have only undergone the gross decontamination phase, the process has **not** been completed. As a result, there is the potential for cross-contamination and all of the associated problems.

## TYPES OF DECONTAMINATION

Depending on the incident situation, **people**, **equipment**, and/or the **environment** may require some degree of decontamination. Again, anyone or anything that is in or enters the hot zone must be decontaminated before leaving that zone.

Normally, response personnel are only involved in decontamination of people and, to a lesser degree, equipment. In most locations, **environmental decontamination (cleanup) is not the job of response personnel**. One exception to this general rule is an industrial Emergency Response Team (ERT). Routinely, ERT's conduct a specific degree of environmental decontamination on the grounds of their own facility. However, most ERT's defer the cleanup of larger release situations to contractors that specialize in environmental cleanup.

An important point is that not all things that are contaminated can be readily decontaminated. For example, in the case of environmental decontamination, contaminated soil most often cannot be decontaminated and must be excavated and disposed of as hazardous waste.

Many other materials also are extremely difficult, if not impossible, to decontaminate, depending on the specific chemical involved. Examples of such materials include

- leather goods (almost **always** impossible to decon);
- street clothing;
- rubber materials, including tires;

- paper (including money) and some plastic products;
- carpeting, such as that found in vehicles;
- drug boxes;
- electronic equipment; and
- blankets, sheets, towels.

Materials that cannot be decontaminated must be appropriately packaged (over-packed, drummed, bagged, etc.), to prevent cross-contamination. Then they must be disposed of, since they have become hazardous waste. Proper procedures must be followed for packaging, transport, and disposal.

## Personnel Decontamination

**People** are the primary focus of emergency response decontamination. Individuals who require decontamination fall into two primary categories:

1. Protected persons.

2. Unprotected victims.

**Protected** means that potential victims were protected by an **appropriate** type of personal protective equipment (PPE). As a result, they did not receive direct body contact with the contaminant.

**Unprotected** means that individuals were **not** protected by appropriate levels of PPE. In this situation, the individual may receive direct body contact with the contaminant. Obviously, such a situation potentially holds dire health implications for the unprotected person.

In general, the **only** persons who fall into the protected category of contaminated people are emergency responders who wear appropriate PPE. **All other contaminated persons**, whether responders or the public, are classified as unprotected and **must be considered victims** of the incident. It is hoped that the full implications of this statement are clear.

Specifically, response personnel who are not equipped with adequate PPE--such as law enforcement, Emergency Medical Services (EMS), public works, security, etc.,--or those who have the equipment but do not use it, **will be considered victims** if they enter the hot zone. Additionally, if such personnel arrive first on the scene and do not establish a large enough perimeter, they are responders about to become victims.

In hazardous materials incidents, the potential dangers of chemical exposure and the resulting contamination often are not obvious or easily proven. As a result, **all incidents involving chemicals must be considered capable of causing exposure and contamination until information proving otherwise is obtained.** Remember, **a contaminated responder is just another victim to be managed during a chemical incident!**

## Protected Person Decontamination

Two-step decontamination for protected persons is by far the easiest and least time-consuming type of decontamination. This statement is not intended to imply that the decontamination process is easy and quick. Rather, it indicates that decontamination of unprotected persons is quite difficult.

**Gross decontamination** for a protected person involves a series of steps. These steps include alternating washes and rinses of the barrier provided by the protective equipment worn by the responder. This series of washes and rinses is intended specifically to remove enough contamination to allow wearers to remove their protective clothing without becoming cross-contaminated.

The following discussion addresses a **maximum** decontamination setup.

Normally, the process starts in the hot zone with a gross wash. This initial wash is followed by entry into the decontamination corridor and the warm zone, where a series of two washes and two rinses takes place. Once the washes and rinses are completed, the protective equipment is removed.

**Secondary decontamination** starts at this point. The individual leaves the decontamination corridor and warm zone and enters the cold zone. The first step is to remove necessary clothing and wash at least the exposed skin. This step may require the individual to remove all clothing and take a full shower, depending upon the exact chemical and the situation.

From here, the individual puts on clean clothing (often disposable paper) and goes for **medical monitoring**. In this step, the physical condition of the person is assessed to ensure that no apparent medical problems exist.

At first, it may appear that the process just outlined is excessive or impossible to accomplish. Nothing can be further from the truth. Granted, not all of these steps are necessary in **all** situations, but first responders normally do not have the information, knowledge, or experience needed to determine what steps can be eliminated. As a result, the responder must be prepared to participate in the maximum decontamination process.

## Contaminated Victim Decontamination

The unprotected person must undergo the same phases of decontamination, but the situation is quite different and often trickier. There are several reasons why it is difficult to decontaminate unprotected persons (victim decontamination).

- **First**, most people equate chemical contamination with pain or severe discomfort. An example would be burns by contamination of the skin with an acid. Unfortunately, such immediately apparent symptoms often are not present. Many chemicals have substantial latency periods. Latency, the delay between the time of exposure to the contaminant and the time when symptoms develop, can range anywhere from minutes to hours, days, or even years. As a result, a person who receives an exposure may not realize an exposure has occurred. When this type of contaminated victim is instructed to go through a decontamination process, an uncooperative response can be anticipated.

- **Second**, since the individual is not protected, exposure can be both **internal** and **external**. Almost without exception, victim decontamination will **address only external** contamination. The same is true, even in a health-care facility. The only exception may be for certain types of ingestion route exposures.

- **Third**, as long as the contaminant is in contact, the victim experiences **ongoing chemical attack**. In essence, the chemical exposure normally will take precedence over any other medical problem exhibited by the victim. Remember, **until decontamination is completed, ongoing chemical attack will occur**.

- **Finally**, because these people are victims, a strong likelihood exists that they may not be ambulatory (able to move themselves). Obviously, a nonambulatory victim requiring decontamination is a major difficulty.

Ambulatory contaminated victims have a tendency to leave the hot zone or perimeter. If the contaminant causes pain or discomfort, the victim may actually "rush" the responders. This action risks cross-contaminating the responders, their vehicles, and expanding the hot zone.

Such ambulatory victims must be ordered to stay at the perimeter or the edge of the hot zone if it has been established. The use of bullhorns or a PA system may be required. The victims should be told why they must not approach responders and what is going to be done for them. They need to know what actions are being taken to establish decontamination and what they are to do.

In any event, both gross and secondary decontamination must be performed on these victims. Normally, we see gross decontamination taking place in the field with secondary decontamination taking place at the health-care facility. It is imperative to note that **prior to transport of a contaminated victim, decontamination must occur**.

Gross decontamination of a victim is rather straightforward, but you must remember that during the process of decontamination, the potential for cross-contamination **always** exists. Because of cross-contamination, personnel performing victim decontamination or any associated emergency medical personnel **must be protected by appropriate PPE**! If protective equipment is not worn, the personnel performing the decontamination will become contaminated victims as well!

**Two primary steps** are involved in victim decontamination. One is the **removal** of contaminated clothing and the other is the **flushing** of the victim with **large** quantities of water for a minimum of 15 minutes. Although both of these steps sound rather straightforward, there are many considerations involved in their implementation.

## Removing Clothing

It is often very difficult to determine if and exactly where clothing is contaminated. As a result, it is better to remove more clothing than initially may appear necessary. Remember, contaminated clothing left in place will allow the contaminant to contact the body and continue the chemical attack.

Another important consideration is the protection and modesty of the victim. Attempts should be made to shield the victim from weather conditions and public onlookers. This shielding should not compromise the safety of the victim or the decon personnel by allowing extended contact with the contaminant.

## Flushing with Water

The removal of contaminated clothing normally is followed by rinsing with relatively large quantities of water for a minimum of 15 to 20 minutes. This particular subject is an area of some controversy. Many believe that in any situation, including water-reactive chemicals, flushing with water is an absolutely essential part of decontamination. Others disagree. It is important to remember that local protocol must be considered when performing decontamination procedures.

**In any event, whenever flushing of contaminants is performed, the runoff must be contained for further evaluation**. In most instances, the runoff water will contain contaminants and must be held and properly disposed of after the flushing process.

Secondary victim decontamination normally occurs at a health-care facility. Some locations have designated and engineered receiving areas for contaminated victims. In others, secondary decontamination occurs outside the building itself. In any event, planning must take place to identify the capabilities of local health-care facilities and the requirements of specific local protocols.

## Transporting Victims

Since gross decon occurs in the field, and secondary decon occurs at the health-care facility, an obvious missing step is transportation. In the case of contaminated victims, transportation from the scene to the health-care facility creates some unique problems and requires some special procedures.

- **First**, **no victim is transported without first undergoing gross decontamination**. The reasons should be obvious by now: continued chemical attack on the victim and **inevitable** cross-contamination.

- **Second**, the health-care facility must be notified **as soon as possible** that a contaminated victim is coming, the product(s) involved, and any other pertinent information. Early notification is vital because most health-care facilities require 15 to 30 minutes to have the needed personnel, equipment, and supplies ready. The local or regional Poison Control Center also should be notified to provide specific data on stabilization, treatment, decontamination, etc.

- **Third**, the victim must be packaged to prevent cross-contamination from the residuals that remain. Packaging normally involves wrapping the victim in warm, absorbent material (such as a disposable blanket) and then covering this layer with a plastic material. This plastic material can range from sheeting to a body bag. The covering should allow the victim to maintain an airway, IV's, and vitals. (In other words, do not zip the body bag all the way up.)

- **Fourth**, the transport unit and crew must be prepared. Normally, all nonessential equipment must be removed from the unit and the interior draped with plastic sheeting. The draping should cover the floor and any other exposed surfaces. The crew also must determine what types of personal protective equipment may be needed. Specific attention must be paid to respiratory, hand, skin, and face protection.

- **Finally**, it is imperative for the transport crew to bring any and all product-specific information to the health-care facility. This information should include product name(s), Material Safety Data Sheets (MSDS's), UN identification numbers, Chemical Abstract Numbers (CAS), and any other pertinent information.

## Decontamination/Access Corridors

A decontamination corridor must be established **before** trained and protected personnel enter the hot zone. The reason is simple: **before anyone can leave the hot zone, he/she must be decontaminated**. If the decontamination corridor is not established prior to entry into the hot zone, there is no safe way **anyone**, even in an emergency, can leave the hot zone.

The graphic on the next page provides an overview of a model decontamination corridor. Some specifics to consider are the **location of the zone perimeters**--hot zone perimeter, warm zone perimeter, and access and decontamination corridor perimeters. The **relationship of the access and decontamination corridors** also is important. In essence, each corridor is **one-way**. Personnel enter the hot zone **only** through the access corridor and leave **only** through the decontamination corridor.

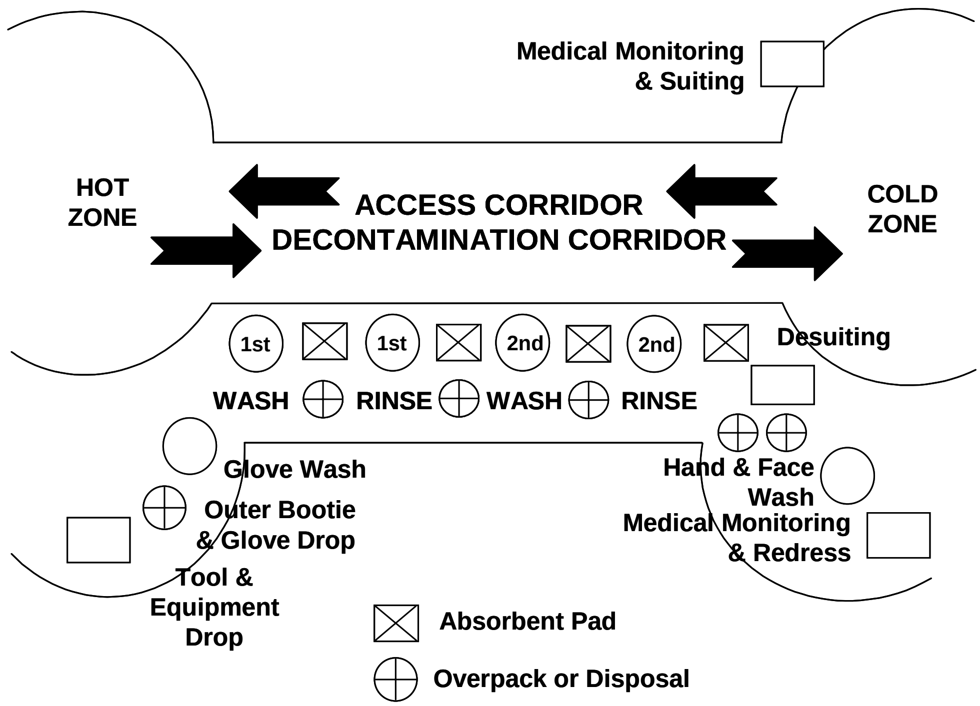


**Figure 8-1**
**Access and Decontamination Setup**

The exact size of the corridors generally depends on the number of steps that are needed to accomplish decontamination. Under the conditions seen in the graphic, the distance from the hot zone perimeter to the warm zone perimeter normally would range from 35 to 50 feet. The decontamination corridor would be 18 to 30 feet wide. The access corridor would be 10 to 25 feet wide.

The decontamination corridor has various stations where different activities take place. Special attention should be given to wash/rinse locations and absorbents that are provided to stop runoff. It is also important to note that the **entire** decontamination corridor is covered with plastic sheeting.

In any event, decontamination must take place in a designated area following specific, designated procedures. A **maximum** layout for gross decontamination normally would include the following:

- tool and equipment drop;
- glove and bootie drop;
- glove wash;
- wash #1;
- rinse #1;

- wash #2;
- rinse #2;
- desuiting;
- hand and face wash;
- redress; and
- medical monitoring.

The specific steps and procedures that are followed depend upon many variables such as the exact product involved, the type of PPE worn, the type of contamination, and so on. Each organization involved must determine and develop SOP's to address its own needs and resources. If the capability to perform appropriate decontamination for a specific type of operation does not exist, then **that operation should not be performed!**

Again, **first responders do not have the level of training needed to perform decontamination procedures.**

## SOURCES OF INFORMATION

When it comes to an actual incident, product-specific information about decontamination may or may not be readily available. Some sources of decontamination information for specific products include

- CHEMTREC;
- the manufacturer of the product;
- MSDS;
- preplan information;
- the Local Emergency Planning Committee (LEPC);
- the State Emergency Response Commission (SERC);
- the National Response Center; and
- local or regional Poison Control Centers.

# APPENDIX

Slide 8-1

**UNIT 8: DECONTAMINATION**

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**TERMINAL OBJECTIVE**

**The students will be able to identify the role of the first responder regarding decontamination during hazardous materials incidents.**

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Slide 8-3

**ENABLING OBJECTIVES**

**The students will:**

- **Describe the process of decontamination.**
- **Explain the critical nature of decontamination for responders and victims.**

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## ENABLING OBJECTIVES (cont'd)

- **Describe how cross-contamination occurs and the associated dangers.**
- **Identify specific steps that must be taken to prevent contamination of responders and others.**

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Slide 8-5

## WHAT IS DECONTAMINATION?

**"Decontamination is the removal of hazardous substances from employees and their equipment, to the extent necessary, to preclude foreseeable health effects."-OSHA**

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## WHAT IS DECONTAMINATION? (cont'd)

**"Decontamination is the physical and/or chemical process of reducing or preventing the spread of contamination from persons and/or equipment."-NFPA**

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## COMBINED DEFINITION

**Decontamination is a chemical or physical process used to remove and prevent the spread of contaminants from an emergency scene to prevent harm to living beings and/or the environment.**

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**The best method to accomplish decontamination is to prevent contamination.**

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Slide 8-9

## PREVENTING AND MINIMIZING CONTAMINATION

- **Follow established standard operating procedures (SOP's)**
- **Observe zones**
- **Approach from uphill, upwind, and upstream**
- **Stay out of visible product**

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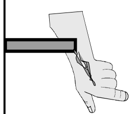
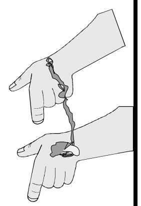
Slide 8-10

## METHODS OF CONTAMINATION

- **Direct**
- **Cross**





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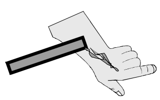
## DIRECT CONTAMINATION

- **Results from entry into the hot zone**
- **Involves direct contact with the contaminant or its byproducts: vapor, smoke, etc.**



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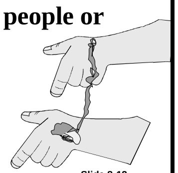
## CROSS-CONTAMINATION

- **Involves contact with a contaminated person or object**
- **Results from contact with people or objects that have not been decontaminated**



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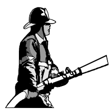
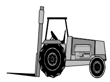
Slide 8-13

## WHAT MAY NEED TO BE DECONTAMINATED?

- **People**
- **Equipment**
- **Environment**





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Slide 8-14

## TWO PHASES OF DECONTAMINATION

- **Gross**
- **Secondary**

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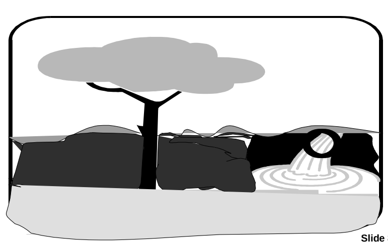
Slide 8-15

## ENVIRONMENTAL DECONTAMINATION IS NOT AN EMERGENCY RESPONSE AGENCY ROLE



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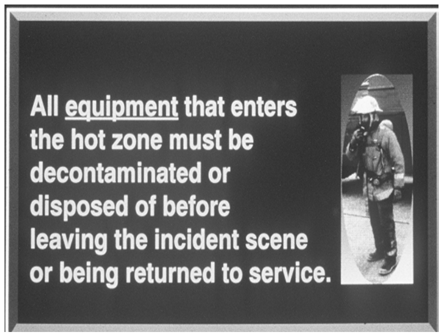


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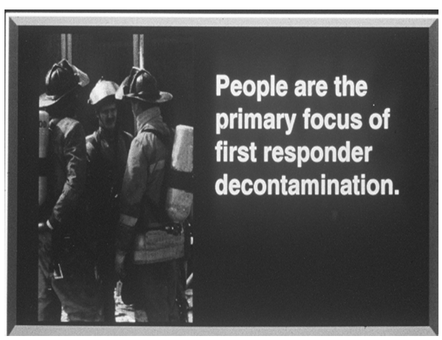


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**TWO TYPES OF CONTAMINATED PEOPLE**

- **Protected responders**
- **Contaminated victims (including unprotected responders)**

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Slide 8-19

## TWO TYPES OF CONTAMINATED VICTIMS

- **Ambulatory**
- **Nonambulatory**

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Slide 8-20

## DECONTAMINATING A PROTECTED PERSON

- **Gross decon--washing, rinsing, and removal of protective equipment**
- **Secondary decon--removal of all clothing, body shower, redress**

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## CONTAMINATED VICTIM CONSIDERATIONS

- **Immediately notify receiving health-care facilities**
- **Contact information authorities (sources)**

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## CONTAMINATED VICTIM GROSS DECONTAMINATION

- **Use appropriate personal protective equipment (PPE)**
- **Remove clothing and bag it**
- **Consider victim's privacy**
- **Control ambulatory victims**

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## CONTAMINATED VICTIM SECONDARY DECONTAMINATION

- **Flush all contaminated body surfaces if appropriate for the contaminates**
- **Collect rinse water**

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## BEFORE TRANSPORTING AND AFTER DECONTAMINATION

- **Prepare transport vehicle and personnel**
- **Package victim**
- **Secure product information**
- **Inform health-care facility**

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Slide 8-25

**Decontamination is crucial to protecting the health and safety of all personnel.**

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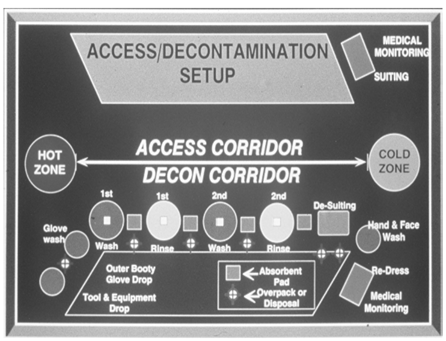


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## KEY POINTS

- **Prevention is the best method of decontamination.**
- **Types of contamination are direct and cross.**
- **The phases of decontamination are gross and secondary.**
- **Decontamination requires proper training, protective equipment, and SOP's.**
- **Methods vary by chemical, level of exposure, and situation.**

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# *UNIT 9: RESOURCES*

### *TERMINAL OBJECTIVE*

*The students will be able to identify, evaluate, and access resources typically available to first responders.*

### *ENABLING OBJECTIVES*

*The students will:*

1. *Recognize resources with potential application in hazardous materials incidents.*
2. *Select appropriate resources for specific hazardous materials incidents.*
3. *Identify sources and procedures for accessing available resources.*

## INTRODUCTION

Broadly defined, resources are people and materials that you can turn to for support or help. They include people, supplies, equipment, information, funding--anything you can use in a hazardous materials emergency. But one characteristic is critical: resources must be readily available to draw upon when needed.

This unit describes categories of resources, which are important to you as a first responder. It discusses ways you can identify available resources in each category, and presents guidance for maintaining accurate resource lists.

## CATEGORIES OF RESOURCES

Resources can be categorized usefully in two ways:

- by **source**--organization or sector where the resource can be obtained; and
- by **type**--based on the nature or purpose of the resource.

Maintaining lists of resources by source and by type, or using a database that allows you to sort the information by these categories, is extremely valuable in an incident. We'll discuss resource lists in more detail later. For now, let's take a closer look at each of these categories.

## SOURCE OR LOCATION OF RESOURCES

Many organizations, both in government and the private sector, have resources available to response agencies. Some of these organizations, including addresses and phone numbers, are listed at the end of this unit.

### Government Resources

The government provides numerous types of resources. There are three basic levels of government:

1. Local.

2. State.

3. Federal.

## Local Government

As discussed previously, local government is the first line of defense against all hazards, the level at which the application of all emergency efforts occur. Local government is responsible for developing an organized, comprehensive emergency management **system** capable of efficient and effective treatment of potential and actual emergencies.

Local government is the first line of planning and training as well. Various agencies may be involved, including emergency management, fire, police, emergency medical services, water department, general counsel, and building and zoning. Each has an important role to play in hazardous materials planning and response.

An important government resource for emergency response agencies is the Local Emergency Planning Committee, or LEPC (discussed in Unit 2: Regulations and Standards). This organization is required by law to maintain preplans and resource lists. First responders should know how to access this information in an emergency.

## State Government

State government is a source of legislated authorities and extraordinary powers affecting disasters. States also possess administrative skills and other resources to supplement and facilitate local efforts.

In their role as a conduit between local and Federal levels of government, States interpret and enforce national laws and programs. They provide planning, funding, and operational support to local government. Various agencies--including environmental resources, emergency management, National Guard, transportation/highway department, and the State Emergency Response Commission (SERC)--will be involved.

Keep in mind that each State and community may have different resources available or may call similar resources by different names. For example, the State of New York has the Department of Environmental Conservation (DEC). The State of New Jersey has the Department of Environmental Protection (DEP). Basically, the two agencies perform similar functions.

## Federal Government

The Federal government provides legal authorities, fiscal resources, research, technical information and services, and specialized personnel. Emergency programs of various Federal agencies are coordinated through the Federal Emergency Management Agency (FEMA).

Federal agencies with a role in hazardous materials planning and response include the Environmental Protection Agency (EPA), Department of Transportation (DOT), National Response Team (NRT), U.S. Coast Guard (USCG), Meteorological Services, and the Department of Defense (DOD). For example, under 40 Code of Federal Regulations (CFR) 310 (found in Appendix D), local governments can request financial restitution for certain costs from EPA.

## Private Sector Resources

The private sector provides an extremely large and diverse base of specialized personnel, technical assistance, equipment, and other material, which can be called upon in an emergency. Examples of valuable private sector sources, which vary from community to community, include

- contractors--waste haulers, cleanup companies, technical experts, consultants;
- manufacturers--chemical, tank, equipment, other suppliers, national associations;
- public utilities--telephone, electric, water, broadcast and cable television, radio, natural gas;
- common carriers--trucking companies, railroads, airlines, shipping firms, pipelines; and
- local institutions--universities, colleges, hospitals, and other health-care facilities, research centers.

## CHEMTREC

Of particular importance to hazardous materials emergency responders is the Chemical Transportation Emergency Center, or CHEMTREC. CHEMTREC, a service of the Chemical Manufacturers Association (CMA), operates around the clock to receive toll-free calls from the United States and Canada, which can be dialed directly at 1-800-424-9300. (For guidebook users in the Washington, DC calling area, change all guide references from the 1-800 number to 703-527-3887.) Emergency collect calls are accepted by the center at 0-703-527-3887.

For emergencies involving chemicals, CHEMTREC provides immediate advice for the onscene commander. CHEMTREC can usually provide hazard information, warnings, and guidance when given the **identification number or name of the product** and the **nature of the problem**. If the product is unknown, give the CHEMTREC communicator as much information about the incident as you know. CHEMTREC then will contact the shipper for more detailed assistance.

CHEMTREC, through its enhanced Hazard Information Transmission (HIT) program, can fax a hard copy of chemical-specific information. This information may include any of more than 400,000 Material Safety Data Sheets (MSDS's) currently on file at CHEMTREC. This service is available only for chemical emergency situations. For additional information on the enhanced HIT program, call the CHEMTREC nonemergency number, 1-703-741-5525.

## Types of Resources

Resources also can be categorized by **type**. One or more types may be available through the various organizational sources discussed above.

In general, the focus of this discussion is on **local** resources available through the private sector, although State and Federal capabilities may be brought to bear in a larger incident. For our purposes, five basic types of resources have been identified

1. People.

2. Services.

3. Equipment/Supplies.

4. Publications.

5. Computer resources.

### People and Services

**People** and **services** vary by location. People who can assist at a haz mat incident range from emergency responders (fire, police, Emergency Medical Services (EMS)) to personnel from local businesses and industry. The next-door neighbor who has a Ph.D. in chemistry or a heavy equipment operator from a local construction firm can be important resources in a hazardous materials emergency.

Finding people and services can be as easy as opening the phone book and being resourceful. Some specialized service resources are spill or cleanup contractors, catering services, technical or analytical assistance, and hazardous waste haulers.

## Equipment and Supplies

**Equipment** and **supplies** sometimes overlap services. For example, cleanup crews may bring their own equipment and supplies, such as trucks, absorbent materials, etc. This saves the responder from making multiple phone calls.

Examples of equipment resources are bulldozers, trucks, generators, handtools, and personal protective equipment (PPE). Useful supplies include cat litter, speedy dry, other absorbent materials, and firefighting foam. Depending on the situation, the list can be almost endless.

## Publications

Hazardous materials include thousands of chemicals, each with complex characteristics and related response requirements. No one, not even the experts, can know everything. For this reason, reference manuals are particularly important in haz mat operations.

Many different **publications** are available. Some useful ones are listed below, although others may be equally or more appropriate in specific situations; you should investigate publications available or recommended in your community. More detail on the following reference materials is included at the end of the unit.

- DOT's *North American Emergency Response Guidebook* (DOTNAERG);
- National Fire Protection Association's (NFPA) *Fire Protection Guide on Hazardous Materials;*
- National Institute for Occupational Safety and Health/Occupational Safety and Health Administration's (NIOSH/OSHA) *Pocket Guide to Chemical Hazards;*
- *The Condensed Chemical Dictionary;*
- DOT's *CHRIS Hazardous Chemical Data*;
- *Dangerous Properties of Industrial Materials,* by Sax;
- *Emergency Handling of Hazardous Materials in Surface Transportation* from the Bureau of Explosives of the Association of American Railroads; and
- *Patty's Industrial Hygiene and Toxicology*.

## Computer Resources

Computer resources can be useful in emergency planning and response by helping to simulate complex chemical reactions (e.g., plume dispersal, chemical identification, spill control, etc.). They also can be used for storage and rapid retrieval of great volumes of data (e.g., resource inventory lists, MSDS forms). Some programs have been developed by private sector companies and may be expensive. Others are available from Federal and State governments at little or no cost.

Important computer resources that you should know about as first responders are

- CAMEO;
- CHRIS or OHM/TADS;
- MICROMEDIX (TOMES); and
- HMIX.

Computer-Aided Management of Emergency Operations (CAMEO)--a Macintosh- and PC-compatible system providing highly detailed air modeling and chemical searching and profiling capabilities. CAMEO addresses the requirements of the Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III for managing community right-to-know surveys and the emergency response and planning information on chemical handling facilities.

Chemical Hazards Response Information System (CHRIS)--a PC-compatible program that displays and/or prints emergency response data on several thousand chemicals. CHRIS often is used in tandem with the Oil and Hazardous Materials Technical Assistance Database System (OHM/TADS).

MICROMEDIX (TOMES) is a computer database or an online service dedicated to providing chemical and drug effects and interactions for hazardous material responders.

Hazardous Materials Information Exchange (HMIX)--this system is a nationwide electronic bulletin board sponsored by FEMA and DOT. The HMIX was designed for the distribution and exchange of hazardous materials information by first responders, private industry, State and local planners, contractors, and others interested in haz mat issues and programs.

## IDENTIFYING RESOURCES

As part of preincident planning, communities decide how to categorize resources and then create a list of what is available locally. The two main categories of government and private sector resources subdivided by resource type (people, services, equipment/supplies, publications, others) is a good place to start.

As a first responder, you should do the same. Prepare a list of resource names and phone numbers before an incident occurs! Also, identify the basic resources that you should carry with you at all times. Then "never leave home without them."

During the incident, be careful to select the appropriate resource for the situation and use the resources effectively

Remember, resources are all around you, limited only by your imagination. The terms "resources" and "resourceful" go hand in hand. Being resourceful means the ability to act effectively in a difficult situation. A difficult situation may be just what you, as a first responder, encounter in a hazardous materials incident. It is important to stay as calm as possible and use your available resources effectively.

One example of an ineffective use of a resource is using 100 gallons of water to wash down a spill area when absorbing the product with 50 pounds of cat litter would do the job more efficiently. Although it would be faster to wash down the spill, that action would create an environmental cleanup 10 times the size. Always think about the consequences.

The regular maintenance of your resource list is critical. The information should be updated regularly, incorporating additions, deletions, and/or changes. By keeping accurate information and using the lists effectively, you can ensure access to the assistance you need during an incident.

# Activity 9.1

# Identifying Resources

## Purpose

To give you an opportunity to identify resources, applications, and sources appropriate to first responders.

## Directions

1. You will be allowed, individually or in small groups, about 5 minutes to answer both questions on the following SAW. Then review the answers in class.

2. You will be given several minutes to answer the first question before a group discussion; then will repeat the process for question two.

3. You may take notes below as the discussion progresses.

## Activity 9.1 (cont'd)

Fill in appropriate answers for each of the following questions. Keep in mind the basic responsibilities of first responders:

1. Recognize and identify the hazard.
2. Notify proper authorities.
3. Isolate the incident scene.
4. Protect yourself and others from exposure.

### Questions

1. What **minimum** resources should **all** first responders have immediately available? (You also may need certain specialized resources specific to your job.)

   ______________________________

   ______________________________

   ______________________________

   ______________________________

2. In your specific situation and local community, where might you find the following types of special resources (list generic information or specific sources, if known)?

| Resource | Source(s) |
|---|---|
| Emergency operating plans for industrial fixed sites | |
| Community services (e.g., highway department, utilities) | |

| Resource | Source(s) |
| --- | --- |
| Weather information | |
| Name of fixed facility owner/manager | |
| Owner of truck | |
| Nature of the chemical hazard | |

# APPENDIX A

| **CHEMTREC**<br>Chemical<br>Transportation<br>Emergency<br>Center | **FOR CHEMICAL EMERGENCY**<br>Spill, Leak, Fire, Exposure, or Accident<br>CALL CHEMTREC—DAY OR NIGHT<br>***800-424-9300**<br>Toll-free in the continental U.S.<br>*Add long-distance access number if required<br>**483-7616 in District of Columbia**<br>**For calls originating outside the Continental U.S.:**<br>**202-483-7616**—Washington, D.C., Collect<br>ALL CALLS ARE RECORDED |
|---|---|

## WHAT IT IS

CHEMTREC, the Chemical Transportation Emergency Center provides information and/or assistance to those involved in or responding to chemical or hazardous material emergencies. Established in 1971, it is a public service of the Chemical Manufacturers Association (formerly Manufacturing Chemists Association) in Washington, D.C.

CHEMTREC operates in two stages: First, on receipt of information regarding the name of a chemical, it provides immediate advice on the nature of the product and steps to be taken in handling the early stages of a problem. Second, CHEMTREC promptly contacts the shipper of the material involved for more detailed information and appropriate follow-up, including on-scene assistance when feasible.

While the Center's primary mission is to help in transportation incidents, it also provides support in chemical and hazardous materials emergencies in non-transportation situations.

CHEMTREC operates 24 hours a day, seven days a week to receive calls on phone numbers shown above. The number is widely circulated in professional literature distributed to emergency service personnel, carriers, the chemical industry, bulletins of government agencies, trade associations and others who may have need. It is not circulated in the public press. The public need is best served through the emergency services.

CHEMTREC is not a reporting center. The Department of Transportation handles this function. CHEMTREC should be called only in those cases where assistance is needed.

CHEMTREC, in its years of operation, unfortunately has received many calls that were not pertinent to emergencies. These calls often interfere with the handling of legitimate emergencies. It is vital that callers understand CHEMTREC is neither intended nor equipped to function as a general information source.

## MODE OF OPERATION

Participating companies are requested to include the following on their shipping documents: "For Chemical Emergency--Spill, Leak, Fire, Exposure, or Accident, Call CHEMTREC 800-424-9300 day or night."

An emergency reported to CHEMTREC is received by the Communicator on duty. Recording details in writing, or on a video-screen, and by tape recorder, they question the caller to determine as much essential information on the problem as possible. This enables them as a first step, to provide the best available information on the chemical(s) reported to be involved, thereby giving specific indication of hazards, what to do, or what not to do in case of spills, fire or exposure.

# APPENDIX B

## PUBLISHED RESOURCES

Department of Transportation. *North American Emergency Response Guide Book.* DOT P 5800.5, 2000.

Sometimes considered the "Bible" for hazardous materials initial response, this concise reference document is probably the most widely distributed haz mat publication in the country. Chemicals can be identified by the 4-digit number on a placard or orange panel, by the 4-digit number (after UN/NA) on a shipping paper or package, or by name of the material on a shipping paper, placard, or package. Responders then can look up one of 61 guides to find information on potential hazards (fire and health) and appropriate emergency actions for the chemical. A table of initial isolation and protective action distances is also provided.

*NIOSH/OSHA Pocket Guide to Chemical Hazards*. Department of Health and Human Services/Department of Labor, June 2000.

Presents information taken from the NIOSH/OSHA Occupational Health Guidelines in a tabular format for ease and convenient use as a quick reference source relating to industrial hygiene and medical surveillance practices. The information elements contained in the *Guide*, covering 380 chemical hazards, include

- chemical names and synonyms;
- permissible exposure limits;
- chemical and physical properties;
- signs and symptoms of overexposure;
- environmental and medical monitoring procedures;
- respiratory and personal protective equipment (PPE) use recommendations; and
- procedures for emergency treatment.

National Fire Protection Association, *Fire Protection Guide on Hazardous Materials*, 13th Edition, 2001.

The *Guide* can be used to identify the hazardous properties of most of the chemicals in commercial use today. It is particularly useful to help fire and police department personnel take proper steps to prevent fires and other emergencies during the use, storage, and transportation of chemicals, and to make informal decisions on the procedures to be followed in an emergency. The *Guide* contains an alphabetical listing of key topics that may be referred to in an emergency.

Hawley, Gessner G. *The Condensed Chemical Dictionary*. 13th ed. New York: Van Nostrand Reinhold Company, 1997.

This revised compendium of technical data and descriptive information covers thousands of chemicals and chemical phenomena, while including additional information on chemical manufacturing equipment and its components, energy sources and their pollution, waste control, etc. Three distinct types of information are given

- technical descriptions of chemicals, raw materials, and processes;
- expanded definitions of chemical entities, phenomena, and terminology; and
- descriptions or identifications of a wide range of trademarked products used in the chemical industries.

Department of Transportation. *CHRIS Hazardous Chemical Data*, 2001.

The CHRIS (Chemical Hazard Response Information System) manual contains a condensed guide to chemical hazards designed to help personnel make the proper response in an emergency situation. It is intended for use by safety personnel and others who may be the first to arrive at the site of an accidental discharge or fire and who need readily available and easily understood information about the hazardous properties of the chemical involved.

Other components of CHRIS include

- Hazardous Chemical Data Manual with detailed chemical, physical, and biological data;
- Response Methods Handbook which describes cautionary and corrective response methods for reducing and eliminating hazards that result from chemical discharge; and
- computerized version of the Hazard Assessment Handbook.

Association of American Railroads, Bureau of Explosives. *Emergency Handling of Hazardous Materials in Surface Transportation.*

Contains over 500 pages of commodity-specific emergency response and environmental containment information on thousands of chemicals listed alphabetically. Descriptions include emergency procedures under different conditions (e.g., if on fire or not) and personal protection measures. Also includes recommendations for response: general rules and rules keyed to specific DOT hazard classes.

Sax, N. Irving. *Dangerous Properties of Industrial Materials*. New York: Van Nostrand Reinhold Company, 2000.

This large reference volume provides a single source for quick, concise hazard-analysis information for nearly 15,000 common industrial laboratory materials. Includes flammability and explosion data, basic toxologic information, fire extinguishment materials, chemical incompatibilities, ventilation procedures and more. The book also contains a series of papers or related topics written by experts in the field.

Clayton, George D., and Florence E. Clayton, Eds. *Patty's Industrial Hygiene and Toxicology*. New York: John Wiley and Sons, 2000.

This major reference book for the occupational health field is in three volumes: General Principles, Toxicology, and Theory and Rationale of Industrial Hygiene Practice. The work includes contributions by recognized authorities in fields such as air pollution, agricultural hazards, odors, heat stress, industrial sanitation, fire and explosion hazards, atmospheric contaminants, epidemiology, lighting, and radiation.

# APPENDIX C

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## UNIT 9: RESOURCES

Slide 9-1

Slide 9-2

## TERMINAL OBJECTIVE

**The students will be able to identify, evaluate, and access resources typically available to first responders.**

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Slide 9-3

## ENABLING OBJECTIVES

**The students will:**

- **Recognize resources with potential application in hazardous materials incidents.**
- **Select appropriate resources for specific hazardous materials incidents.**
- **Identify sources and procedures for accessing available resources.**

Slide 9-3

Slide 9-4

## RESOURCE

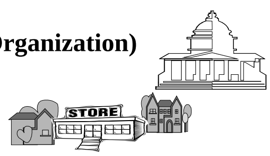
**Someone or something that can be used for support or help at a haz mat incident.**

Slide 9-4

Slide 9-5

## RESOURCE CATEGORIES

- **Source (Sector/Organization)**
  - **Government**
  - **Private sector**
- **Type**
  - **Dozers**
  - **Booms**
  - **Foam**
  - **Sand**




Slide 9-5

Slide 9-6

## LOCAL GOVERNMENT

- **It is the first line of defense.**
- **It consists of many response agencies.**
- **It consists of many other service agencies related to health, utilities, building, zoning, planning, etc.**

Slide 9-6

Slide 9-7

## STATE GOVERNMENT

- **It offers planning, funding, and operational support.**
- **It is the conduit between local and Federal agencies.**
- **It consists of various agencies or commissions such as health, environmental protection, transportation or highways, law enforcement, military support, etc.**

Slide 9-7

Slide 9-8

## FEDERAL GOVERNMENT

- **It provides national resources and programs coordinated through the Federal Emergency Management Agency (FEMA).**
- **It is the basis for legal authorities, research, technical information, specialized personnel, and services.**

Slide 9-8

Slide 9-9

## FEDERAL GOVERNMENT (cont'd)

- **Various agencies or departments are associated with hazardous materials response such as Environmental Protection Agency (EPA), Department of Transportation (DOT), FEMA, Occupational Safety and Health Administration (OSHA), and Department of Defense (DOD).**
- **Other Federal elements such as the National Response Team (NRT) can assist.**

Slide 9-9

Slide 9-10

## PRIVATE SECTOR RESOURCES

- **Contractors**
- **Manufacturers**
- **Public utilities**
- **Common carriers**
- **Local institutions**

Slide 9-10

Slide 9-11

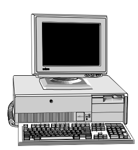
## CHEMICAL TRANSPORTATION EMERGENCY CENTER

- **It is a service of the Chemical Manufacturers Association (CMA).**
- **It provides initial information and contact with technical experts, manufacturers, associations, shippers, etc.**
- **It has a 24-hour hotline: 800-424-9300.**

Slide 9-11

Slide 9-12

## TYPES OF RESOURCES



- **People**
- **Services**
- **Equipment/ Supplies**
- **Publications**
- **Computer resources**

Slide 9-12

Slide 9-13

## PEOPLE

- **Manual labor**
- **Specialized equipment operators**
- **Technical experts**

Slide 9-13

Slide 9-14

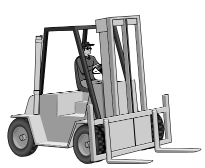
## SERVICES

- **Cleanup companies**
- **Transporters**
- **Analytical services**

Slide 9-14

Slide 9-15

## EQUIPMENT/SUPPLIES



- **Heavy equipment**
- **Light equipment**
- **Supplies**
  - **Food/PPE**
  - **Absorbents, diking materials, foam, etc.**
  - **Sanitary services**

Slide 9-15

Slide 9-16

## PUBLICATIONS

- **DOT--*North American Emergency Response Guidebook***
- **NIOSH--*Pocket Guide to Chemical Hazards***
- **NFPA--*Fire Protection Guide on Hazardous Materials***

Slide 9-16

Slide 9-17

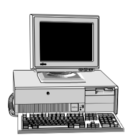
## OTHER REFERENCE DOCUMENTS

- ***The Condensed Chemical Dictionary***
- ***CHRIS Hazardous Chemical Data***
- ***Emergency Handling of Hazardous Materials in Surface Transportation***
- **Sax-*Dangerous Properties of Industrial Materials***

Slide 9-17

Slide 9-18

## COMPUTER RESOURCES

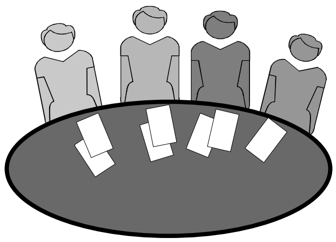


- **Software Programs**
  - **CAMEO**
  - **CHRIS OHM-TADS**
  - **MICROMEDIX (TOMES)**
  - **HMIX**
  - **Various State programs**

Slide 9-18

Slide 9-19

**Activity 9.1**
**Identifying Resources**



Slide 9-19

Slide 9-20

**KEY POINTS**

- **Resources include anything useful during an incident.**
- **Resources can be categorized by**
  - **Sector/Organization.**
  - **Type.**
- **Use resources wisely; be creative!**
- **Analyze your specific needs and capabilities.**

Slide 9-20

# *UNIT 10: COURSE WRAP-UP*

### *TERMINAL OBJECTIVE*

*The students will be able to apply concepts learned in the course to representative hazardous materials incidents.*

### *ENABLING OBJECTIVES*

*The students will:*

1. *Use available information sources to identify actions appropriate to a first responder for a specific incident.*

2. *Use available resources to fill out an incident data sheet about the incident.*

3. *Summarize key points learned in the course.*

## INTRODUCTION

In Unit 1: Introduction, we discussed the four general responsibilities of the first responder:

### Recognition and Identification

- recognize the presence of hazardous materials;
- identify the material, if possible; and
- gather information.

### Notification

- notify the proper authorities;
- call for assistance; and
- provide updates.

### Isolation

- set perimeters/zones;
- deny entry; and
- evacuate.

### Protection

- initiate the Incident Command System (ICS);
- protect responders/public;
- initiate defensive actions only (no intentional contact); and
- initiate decontamination.

In this unit, you will work with several scenarios; keep these responsibilities in mind as you plan your response activities.

# Activity 10.1

# "Odor of Gas" Complaint

## Purpose

To identify initial actions for a first responder at a specific incident, given a scenario.

## Directions

1. You will work in small groups.

2. From the slide and the information provided, fill out answers to the questions on the next page. Be prepared to discuss your answers with the class.

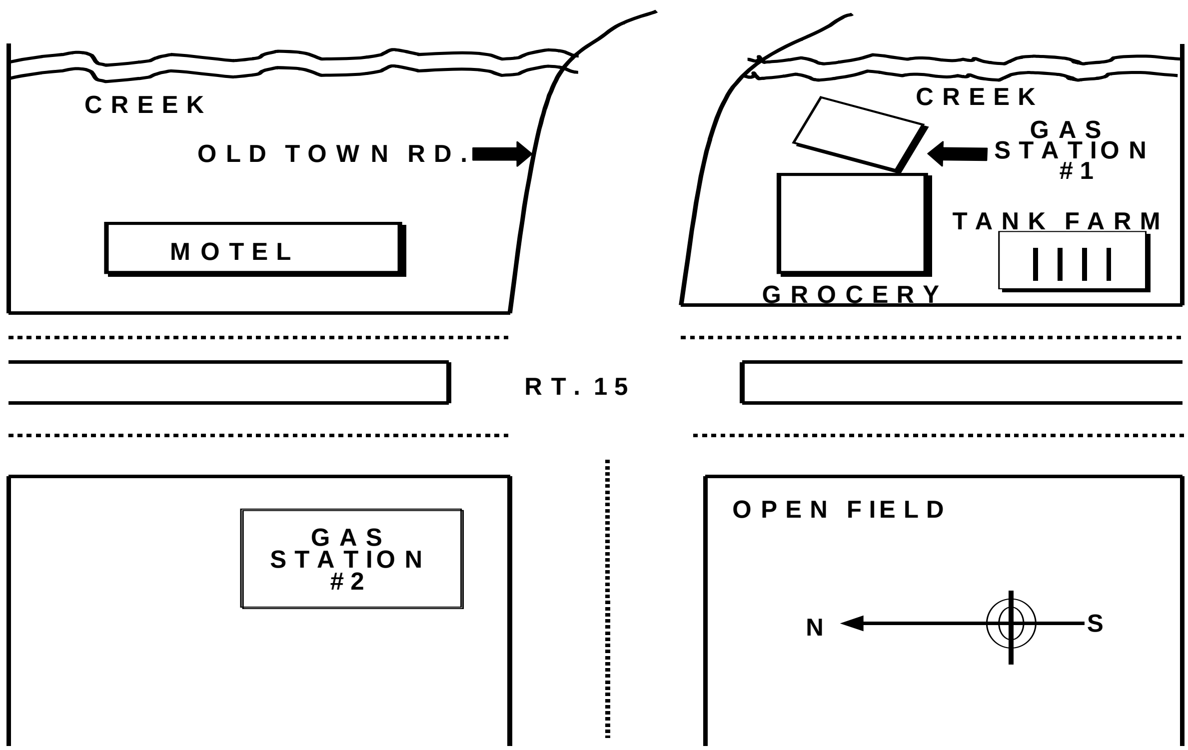
## Activity 10.1 (cont'd)

### Scenario

You have been dispatched for a strong odor of gas in the area of the motel at the intersection of Rt. 15 and Old Town Road. The motel is occupied by four staff and 25 guests. Gas stations #1 and #2 each have one attendant working.

It is 0900 Sunday morning. Weather conditions are sunny and warm, temperature in the low 80's, wind coming from the south at 10 mph, gusting to 25 mph. The stream flow is the same direction as the wind. You are approaching from the west on Old Town Road.

A second call indicates that a strong odor of gas is now being reported from station #2.



## Activity 10.1 (cont'd)

## Worksheet

Explain how the responders should address the following functions:

1. Recognition and identification:

   How? ______________________________

   Additional information needed? ______________________________

   ______________________________

   How to obtain? ______________________________

2. Notification:

   Who? ______________________________

   How? ______________________________

   When? ______________________________

3. Isolation:

   Where do you stop? ______________________________

   Where is the perimeter? ______________________________

   Where are the zones? ______________________________

4. Protection:

   How do you protect the public? ______________________________

   ______________________________

   How do you protect the responders? ______________________________

   ______________________________

5. Additional considerations: ______________________________

   ______________________________

   ______________________________

# Activity 10.2

## Leaking Tanker Truck

### Purpose

To use available resources to fill out an incident data sheet.

### Directions

1. From the slides and the data provided, complete the Incident Data Sheet provided.

2. Identify where the perimeter should be established, and the appropriate NAERG number that should be followed, and answer the questions on the following Worksheet.

## Activity 10.2 (cont'd)

## Worksheet

### Scenario

You have been dispatched to a disabled tanker along the side of the highway. It is 1500 hours on an overcast Tuesday in September with a threat of showers. The temperature is 50 degrees and wind is from the south at 5 to 10 mph. The stream is flowing in the same direction as the wind. The driver is not visible from your location.

Identify the following:

1. Recognition and identification procedures. ______________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

2. Notification:

   Who needs to be notified? ______________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

3. Isolation:

   Identify the perimeter and zones. ________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

4. Protection:

   Identify protection measures.

   Public. ______________________________________________________

______________________________________________________________

   Responders. __________________________________________________

______________________________________________________________

## Activity 10.2 (cont'd)

## Incident Data Sheet

When approaching the scene of an accident involving any cargo (not only regulated hazardous materials):

- Approach incident from an upwind direction, if possible.
- Move and keep people away from incident scene.
- Do not walk into or touch any spilled material.
- Avoid inhaling fumes, smoke, or vapors even if no hazardous materials are involved.
- Do not assume that gases or vapors are harmless because of lack of smell--odorless gases or vapors may be harmful.

The following telephone numbers may be useful during hazardous materials incidents:

| | |
|---|---|
| CHEMTREC | 1-800-424-9300<br>(Washington, DC 202-483-7616) |
| National Response Center (NRC) | 1-800-424-8802<br>(Washington, DC 202-267-2675) |

When calling either center, provide as much information as possible including, as a minimum, the following:

- Caller's Name ____________________
- Call-back Number ____________________
- Names of:

  Carrier ____________________
  Shipper ____________________
  Manufacturer ____________________
  Facility Owner ____________________

- Incident Data ____________________

  Nature - fixed facility [ ], transportation [ ], spill [ ], fire [ ], explosion [ ], flowing product [ ], Other Information ______________________________

Contamination - to people [ ], to environment [ ], spreading [ ],

Location/Address ______________________________
______________________________

Time ______________________________

- Product Information:

Name(s) ______________________________
UN ID# ______________________________
ERG Guide # ______________________________
Placards/Labels ______________________________

Other information - MSDS [ ], shipping papers [ ], HMIS [ ],
NFPA 704 [ ], Information included ______________________________
______________________________

- Container Information:

Container type ______________________________
Railcar #/s ______________________________
Truck #/s ______________________________
Vessel Name ______________________________

Other Information ______________________________

# APPENDIX

Slide 10-1

**UNIT 10:**
**COURSE WRAP-UP**

Slide 10-1

Slide 10-2

**TERMINAL OBJECTIVE**

**The students will be able to apply concepts presented in the course to representative hazardous materials incidents.**

Slide 10-2

Slide 10-3

**ENABLING OBJECTIVES**

**The students will:**

- **Use available information sources to identify actions appropriate to a first responder for a specific incident.**
- **Use available resources to fill out an incident data sheet about the incident.**
- **Summarize key points learned in the course.**

Slide 10-3

Slide 10-4

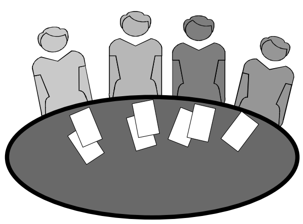
## FIRST RESPONDER RESPONSIBILITIES

- **Recognition and identification**
- **Notification**
- **Isolation/Denial of entry**
- **Protection**

Slide 10-4

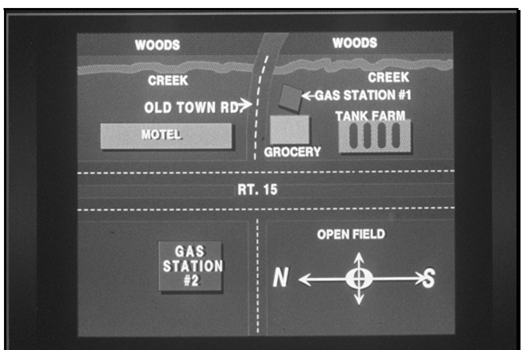
Slide 10-5

## Activity 10.1 "Odor of Gas" Complaint



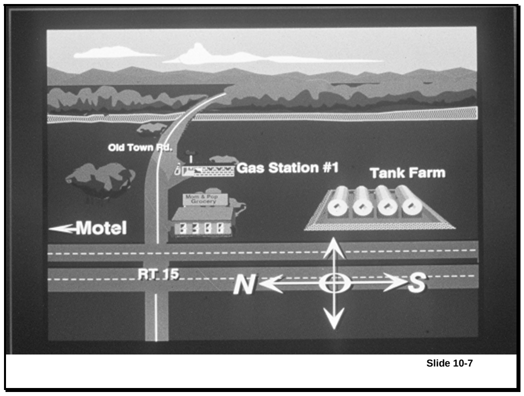
Slide 10-5

Slide 10-6

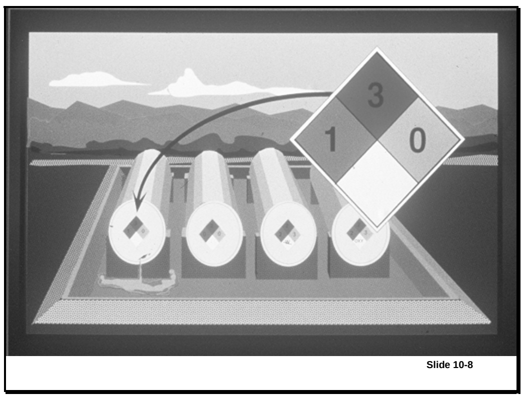



Slide 10-6

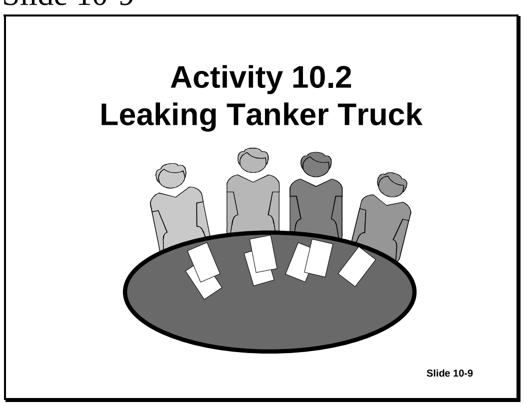
Slide 10-7



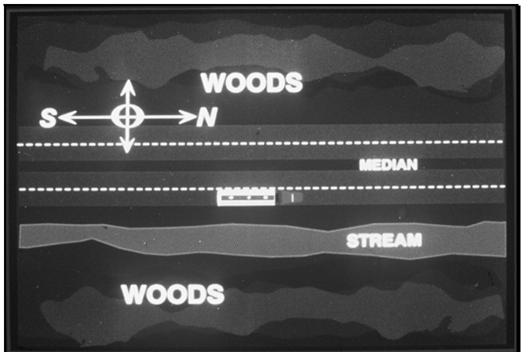

Slide 10-8




Slide 10-9

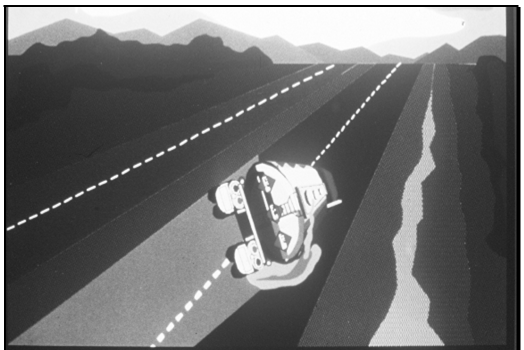


Slide 10-10



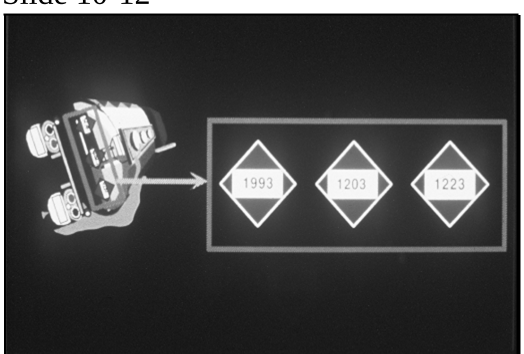

Slide 10-10

Slide 10-11



Slide 10-11

Slide 10-12




Slide 10-12

Slide 10-13

## COURSE SUMMARY

**What are some key points you learned in the course?**

Slide 10-13

# APPENDIX A

# 29 CFR 1910.120

## 29 CFR 1910.120

(q) *Emergency response to hazardous substance releases.* This paragraph covers employers whose employees are engaged in emergency response no matter where it occurs except that it does not cover employees engaged in operations specified in paragraphs (a) (1) (i) through (a) (1) (iv) of this section. Those emergency response organizations who have developed and implemented programs equivalent to this paragraph for handling releases of hazardous substances pursuant to section 303 of the Superfund Amendments and Reauthorization Act of 1986 (Emergency Planning and Community Right-to-Know Act of 1986, 42 U.S.C. 11003 shall be deemed to have met the requirements of this paragraph.

(1) *Emergency response plan.* An emergency response plan shall be developed and implemented to handle anticipated emergencies prior to the commencement of emergency response operations. The plan shall be in writing and available for inspection and copying by employees, their representatives, and OSHA personnel. Employers who will evacuate their employees from the workplace when an emergency occurs, and who do not permit any of their employees to assist in handling the emergency, are exempt from the requirements of this paragraph if they provide an emergency action plan in accordance with § 1910.38(a) of this part.

(2) *Elements of an emergency response plan.* The employer shall develop an emergency response plan for emergencies which shall address, as a minimum, the following to the extent that they are not addressed elsewhere:

(i) Pre-emergency planning and coordination with outside parties.

(ii) Personnel roles, lines of authority, training, and communication.

(iii) Emergency recognition and prevention.

(iv) Safe distances and places of refuge.

(v) Site security and control.

(vi) Evacuation routes and procedures.

(vii) Decontamination.

(viii) Emergency medical treatment and first aid.

(ix) Emergency alerting and response procedures.

(x) Critique of response and follow-up.

(xi) PPE and emergency equipment.

(xii) Emergency response organizations may use the local emergency response plan or the state emergency response plan or both, as part of their emergency response plan to avoid duplication. Those items of the emergency response plan that are being properly addressed by the SARA Title III plans may be substituted into their emergency plan or otherwise kept together for the employer and employee's use.

(3) *Procedures for handling emergency response.* (i) The senior emergency response official responding to an emergency shall become the individual in charge of a site-specific Incident Command System (ICS). All emergency responders and their communications shall be coordinated and controlled through the individual in charge of the ICS assisted by the senior official present for each employer.

**Note to (q) (3) (i)**—The "senior official" at an emergency response is the most senior official on the site who has the responsibility for controlling the operations at the site. Initially it is the senior officer on the first-due piece of responding emergency apparatus to arrive on the incident scene. As more senior officers arrive (i.e., battalion chief, fire chief, state law enforcement official, site coordinator, etc.) the position is passed up the line of authority which has been previously established.

(ii) The individual in charge of the ICS shall identify, to the extent possible, all hazardous substances or conditions present and shall address as appropriate site analysis, use of engineering controls, maximum exposure limits, hazardous substance handling procedures, and use of any new technologies.

(iii) Based on the hazardous substances and/or conditions present, the individual in charge of the ICS shall implement appropriate emergency operations, and assure that the personal protective equipment worn is appropriate for the hazards to be encountered. However, personal protective equipment shall meet, at a minimum, the criteria contained in 29CFR 1910.156(e) when worn while performing fire fighting operations beyond the incipient stage for any incident or site.

(iv) Employees engaged in emergency response and exposed to hazardous substances presenting an inhalation hazard or potential inhalation hazard shall wear positive pressure self-contained breathing apparatus while engaged in emergency response, until such time that the individual in charge of the ICS determines through the use of air monitoring that a decreased level of respiratory protection will not result in hazardous exposures to employees.

(v) The individual in charge of the ICS shall limit the number of emergency response personnel at the emergency site, in those areas of potential or actual exposure to incident or site hazards, to those who are actively performing emergency operations. However, operations in hazardous areas shall be performed using the buddy system in groups of two or more.

(vi) Back-up personnel shall stand by with equipment ready to provide assistance or rescue. Advance first aid support personnel, as a minimum, shall also stand by with medical equipment and transportation capability.

(vii) The individual in charge of the ICS shall designate a safety official, who is knowledgeable in the operations being implemented at the emergency response site, with specific responsibility to identify and evaluate hazards and to provide direction with respect to the safety of operations of the emergency at hand.

(viii) When activities are judged by the safety official to be an IDLH condition and/or to involve an imminent danger condition, the safety official shall have the authority to alter, suspend, or terminate those activities. The safety official shall immediately inform the individual in charge of the ICS of any actions needed to be taken to correct these hazards at an emergency scene.

(ix) After emergency operations have terminated, the individual in charge of the ICS shall implement appropriate decontamination procedures.

(x) When deemed necessary for meeting the tasks at hand, approved self-contained compressed air breathing apparatus may be used with approved cylinders from other approved self-contained compressed air breathing apparatus provided that such cylinders are of the same capacity and pressure rating. All compressed air cylinders used with self-contained breathing apparatus shall meet U.S. Department of Transportation and National Institute for Occupational Safety and Health criteria.

(4) *Skilled support personnel.* Personnel, not necessarily an employer's own employees, who are skilled in the operation of certain equipment, such as mechanized earth moving or digging equipment or crane and hoisting equipment, and who are needed temporarily to perform immediate emergency support work that cannot reasonably be performed in a timely fashion by an employer's own employees, and who will be or may be exposed to the hazards at an emergency response scene, are not required to meet the training required in this paragraph for the employer's regular employees. However, these personnel shall be given an initial briefing at the site prior to their participation in any emergency response. The initial briefing shall include instruction in the wearing of appropriate personal protective equipment, what chemical hazards are involved, and what duties are to be performed. All other appropriate safety and health precautions provided to the employer's own employees shall be used to assure the safety and health of these personnel.

# APPENDIX B

# STENCILING COMMODITY NAMES

## STENCILING COMMODITY NAMES

The following is a list of hazardous materials whose commodity names must be stenciled on the sides of tank cars as required by either the department of transportation or the association of American railroads. This list of commodities changes is recent. Additions may be obtained by checking with AAR.

Acrolein.
Anhydrous Ammonia.
Bromine.
Butadiene.
Chlorine.
Chlorophrene (When Transported In Dot 115a Specification Tank Car).
Difluoroethane.*
Difluoromonochloromethane.*
Dimethylamine, Anhydrous.
Dimethyl Ether (Transported Only In Ton Cylinders).
Ethylene Oxide.
Formic Acid.
Fused Potassium Nitrate And Sodium Nitrate.
Hydrocyanic Acid.
Hydrofluoric Acid.
Hydrogen Chloride (By Exemption From Dot).
Hydrogen Fluoride.
Hydrogen Peroxide.
Hydrogen Sulfide.
Liquefied Hydrogen.
Liquefied Hydrocarbon Gas (May Also Be Stenciled Propane, Butane).
Liquefied Petroleum Gas (Propylene, Ethylene).
Methyl Acetylene Propadiene Stabilized.
Methyl Chloride.
Methyl Mercaptan.
Methyl Chloride - Methylene Chloride Mixture.
Monomethylamine, Anhydrous.
Motor Fuel Antiknock Compound Or Antiknock Compound.
Nitric Acid.
Nitrogen Tetroxide.
Netrogen Tetroxide-Nitric Oxide Mixture.
Phosphorus.
Sulfur Trioxide.
Trifluorochloroethylene.*
Trimethylamine, Anhydrous.
Vinyl Chloride.
Vinyl Fluoride Inhibited.
Vinyl Methyl Ether Inhibited.

*May be stenciled **dispersant gas** or **refrigerant** gas in lieu of name. Only flammable refrigerant or dispersant gases are so stenciled.

# APPENDIX C

# ASSORTED PAPERS

## TRAIN--01CBM

006 FROM CABOOSE GATX 10874

| | | | |
|---|---|---|---|
| STC CODE | - | 4905781 | ID NUMBER--UN1075 |
| PROPER SHIPPING NAME | - | PROPANE | |
| HAZARD CLASS | - | FLAMMABLE GAS | |
| PLACARD REQUIRED | - | FLAMMABLE GAS | |
| PLACARD ENDORSEMENT | - | DANGEROUS | |

Propane is a colorless gas with a faint petroleum like odor. It is shipped as a liquefied gas under its vapor pressure. For transportation it may be stenched. Contact with the liquid can cause frostbite. It is easily ignited. Its vapors are heavier than air and a flame can flash back to the source of leak very easily. This leak can be either a liquid or vapor leak. It can asphyxiate by the displacement of air. Under fire conditions the cylinders or tank cars may violently rupture or rocket.

**If material on fire or involved in fire**

Do not extinguish fire unless flow can be stopped.
Use water in flooding quantities as fog.
Cool all affected containers with flooding quantities of water.
Apply water from as far a distance as possible.

**If material is not on fire or involved in fire**

Keep sparks, flames, and other sources of ignition away.
Keep materials out of water sources and sewers.
Attempt to stop leak if without hazard.
Use water spray to knock down vapors.

**Personnel protection**

Avoid breathing vapors.
Keep upwind.
Wear protective gloves and goggles.
Do not handle broken packages without protective equipment.
Approach fire with caution.

**Evacuation**

If fire becomes uncontrollable or container is exposed to direct flame, evacuate for a radius of 2500 feet.
If material leaking (not on fire), downwind evacuation must be considered.

Sample of emergency response information from a Union Pacific Railroad **Wheel Report** (Consist)

## TRAIN LIST ISSUE NO.1

| TRAIN/JOB | CONDUCTOR | ENGINEER | ISSUING | STATION/YARD | CALLED |
|---|---|---|---|---|---|
| SSK117 | ELLIOTT | TARWATER | MXOO1 | STLOUIS MO | 0600 |

SLMO-KCMO SPEC

| ENGINE-IDENT | | HORSEPOWER | LENGTH | STATUS |
|---|---|---|---|---|
| ENG | 3508 | 3500 | 59 | |
| ENG | 3514 | 3500 | 59 | |
| TOTAL | | 7000 HP | 118 FEET | |

TRAIN/JOB-- SSK117 WITH FOLLOWING CARS STLOUIS MO TIME-- 08/17 0600

SEQ EQUIPMNT ID KND GWT COMDTY DESTN ZTS/CARR NXBLK CITY/STATE CONSIGNEE

BLOCK-- CAB MX283

1 CAB 13506 LZ 30

BLOCK-- KCMO MX283

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 DRGW | 19395 | EH3C | 30 | | 94MX905 DRGW | KP 1 | PUEBLO | CO | AGENT |
| 3 ATSF | 302444 | ECDB | 30 | | 83MX283 ATSF | ATSF | KANCITY | MO | AGENT |
| 5 RBOX | 20413 | LB5H | 75 | PLPBRD | 830 027 99-999-99 | 551A | LEAVENWORKS | | HALLMA CARDS |
| 6 RBOX | 40939 | LB5H | 75 | PLPBRD | 830 027 99-999-99 | 551A | LEAVENWORKS | | HALLMA CARDS |
| 7 ACFX | 83903 | LT25 | 73 | FLMLIQ | 92T 130 99-999-99 | OSAW | TOPEKA | KS | PENN STA CHE |

UN2055 PLACARDED FLAMMABLE CAR TRIP LEASED TO CONSIGNEE

IN EMERGENCY CALL 800-424-9300

BLOCK TOTALS 3 LOADS 3 MTYS 3 G-TONS 300 FEET

BLOCK-- JCTY MX125

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 8 MP | 823034 | LUEB | 90 | LUMBER | 82MX125 99-999-99 | JEFCITY | MO | BROADV LBR |
| 9 BCIT | 801067 | LBEN | 75 | LUMBER | 82MX125 99-999-99 | JEFCITY | MO | BROADV LBR |
| 10 BCIT | 800782 | LB5K | 92 | LUMBER | 82MX125 99-999-99 | JEFCITY | MO | BROADV LBR |

Sample of a page from a Missouri Pacific Railroad **Consist.**

ICC 233 - 2 YR. RET.
ICC 237 - 3 YR. RET.
PLACE SPECIAL SERVICE PASTERS HERE

802 — UNION PACIFIC RAILROAD COMPANY — 802
FREIGHT AND TRANSIT WAYBILL

UNION PACIFIC

FORM 715
REV. 7-1

3

**DANGEROUS**

D FOR SINGLE CONSIGNMENTS CARLOAD, LESS CARLOAD AND TOFC

| CAR INITIAL | NUMBER | KIND | TONS GROSS | TARE | NET | LENGTH / CAPACITY OF CAR ORDERED | FURNISHED | PREPAID FREIGHT BILL NUMBER | WAYBILL DATE | WAYBILL NO. |
|---|---|---|---|---|---|---|---|---|---|---|
| GATX | 10874 | T9 | | | 64 | | | | July 23, 80 | 74107 |

| TRAILER / CONTAINER INITIAL | NUMBER | PLAN | LENGTH |
|---|---|---|---|
| | | | |

ORIGIN AND DATE, ORIGINAL CAR, TRANSFER FREIGHTBILL AND PREVIOUS WAYBILL REFERENCE AND ROUTING WHEN REBILLED

ORIGIN FIRM CODE

DESTN FIRM CODE

STOP THIS CAR AT STATION NO. / STATION / STATE
1ST
2ND
3RD

CONSIGNEE AND ADDRESS AT STOP / REASON FOR STOP
1ST
2ND
3RD

TO STATION NO. / STATION / STATE
SPRINGFIELD OREGON

ROUTE: SHOW EACH JUNCTION AND CARRIER IN ROUTE ORDER TO DESTINATION OF WAYBILL. / CODE
UP EAST PORTLAND SP

SHIPPERS OR AGENTS ROUTING "S" OR "A": S

FROM: NUMBER / STATION / STATE
ORIGIN 000090 Los Angeles California
BILLED AT

RECONSIGNED TO: AUTHORITY STATION NO. / STATION / STATE / RWC

SHIPPER AND COMPLETE ADDRESS / CODE
CANMORE MINES LTD.
5000 Ferguson Drive
LOS ANGELES, CALIFORNIA 90022

BILL OF LADING OR INVOICE NUMBER / ORDER NUMBER

CONSIGNEE AND COMPLETE ADDRESS / CODE
CALGAS LANE COUNTY, INC
SPRINGFIELD, OREGON 97101

SHOW TO WHOM FREIGHT BILL SHOULD BE BILLED NAME, ADDRESS, CITY, STATE, AND ZIP CODE
AGREEMENT WEIGHTS

FINAL DESTN.—ADDITIONAL ROUTING
SPRINGFIELD, OREGON

WEIGHED AT / AGREEMENT NUMBER

| GROSS | TARE | ALLOWANCE | NET |
|---|---|---|---|
| | | | |

INSTRUCTIONS: REGARDING PROTECTIVE SERVICE, MILLING, WEIGHING, ETC. SPECIFY TO WHOM THESE CHARGES, IF ANY SHOULD BE BILLED
CAR TRIP LEASED TO CONSIGNEE GROSS GAL. 25427
NET C GAL. 25198 US 30261 TEMP.
65 TARIFF 5.02 GRAVITY 503 INSPEC. CAPS
12/6/79 VALVES SAME

WHEN SHIPPER IN THE UNITED STATES EXECUTES THE NO-RECOURSE CLAUSE OF SECTION 7 OF THE BILL OF LADING INSERT YES

PREPAID — IF CHARGES ARE PREPAID, INSERT "PREPAID"

LEASED CAR — INCENTIVE OR LEASED CAR, OR UNIT TRAIN NUMBER

*If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight."

Note—Where the rate is dependent upon value, shippers are required to state specifically in writing the agreed or declared value of the property. The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding PER

| NO. PKGS. | DESCRIPTION OF ARTICLES (COMMODITY CODE NO. 49-057-81) | * WEIGHT | RATE | FREIGHT | ADVANCES | PREPAID |
|---|---|---|---|---|---|---|
| 1 T/C | LIQUIFIED PETROLEUM GAS<br>FLAMMABLE GAS<br>UN 1075<br>PLACARDED: FLAMMABLE GAS | 126,494 LBS | Weights and charges to follow. PREPAID. | | | |

DESTINATION AGENT'S FREIGHT BILL NUMBER

| FIRST JUNCTION | SECOND JUNCTION | THIRD JUNCTION | FOURTH JUNCTION | REPORTING AGENT WILL STAMP HEREIN STATION AND DATE REPORTED. |
|---|---|---|---|---|
| | | | | |

Sample of a **Waybill**. Note hazardous material entries.

(For use in connection with Uniform Domestic Straight Bill of Lading, adopted by Carriers in Official, Southern, Western and Illinois Classification Territories, March 15, 1922, as amended August 1, 1930, and June 15, 1941.)

THIS MEMORANDUM is an acknowledgment that a bill of lading has been issued and is not the *Original Bill of Lading nor a copy or duplicate* covering the property named herein, and is intended solely for filing or record.

Shipper's No. A 136
Agent's No. 487222

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading,

at Rockville, Maryland August 1, 19 81

from Murray's Compressed Gas Company

the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below, which said company (the word company being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its own road or its own water line, otherwise to deliver to another carrier on the route to said destination. *It is mutually agreed*, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the conditions not prohibited by law, whether printed or written, herein contained, including the conditions on back hereof, which are hereby agreed to by the shipper and accepted for himself and his assigns.

Consigned to Hunter Chemical Company, Inc. (Mail or street address of consignee—For purposes of notification only.) 13255 Lakeside Drive

Destination Bowling Green State of Kentucky County of Warren

Route Agent's routing

Delivering Carrier Acme Transport Company Car Initial UPZX Car No. 189756

| No. Packages | DESCRIPTION OF ARTICLES, SPECIAL MARKS, AND EXCEPTIONS | COMMODITY CODE NO. ( ) | *WEIGHT (Subject to Correction) | CLASS OR RATE | CHECK COLUMN |
|---|---|---|---|---|---|
| 10 Drum | Acetone, Flammable Liquid UN 1090 | | 4500 lbs | | |
| 40Cyl | Nitrogen, Nonflammable Gas UN 1066 | | 4000 lbs | | |
| | | | | | |
| | | | | | |
| | This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation, according to the applicable regulations of the Department of Transportation. | | | | |
| | Signed E J Smith | | | | |

Subject to Section 7 of conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:

The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

(Signature of Consignor.)

If charges are to be prepaid, write or stamp here, "To be Prepaid."

To be Prepaid

Received $ ____ to apply in prepayment of the charges on the property described hereon.

Agent or Cashier.

Per ____ (The signature here acknowledges only the amount prepaid.)

Charges Advanced

$ ____

*If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight."

NOTE—Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.

The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding ____ per ____

____ Shipper. ____ Agent.

Per ____ Per ____

Permanent postoffice address of Shipper ____ 3

COURTESY, SAFETY AND RELIABLE SERVICE

Example of a **Bill Of Lading**.

IATA & DOMESTIC AIR

**SHIPPER'S CERTIFICATION FOR RESTRICTED ARTICLES**
(excluding radioactive materials)
PRINT, TYPE OR USE BLOCK LETTERS

IATA & DOMESTIC AIR

WARNING Failure to comply in all respects with the IATA Restricted Articles Regulations may be a breach of the applicable law subject to legal penalties This certification shall in no circumstance be signed by an IATA Cargo Agent, consolidator, or a forwarder

This consignment is within the limitations prescribed for (mark one)
☐ both passenger and cargo aircraft ☒ only cargo aircraft

| Number of Packages | Article Number (See Section IV RAR) | Proper Shipping Name of Article as shown in Section IV of IATA Restricted Articles Regulations (RAR) Specify each article separately | Class | IATA Packaging Note no applied | Net Quantity Per Package | Flashpoint (Closed-cup) for Flammable Liquids °C | °F |
|---|---|---|---|---|---|---|---|
| 1 | 784 | FLAMMABLE LIQUID N.O.S. HAVING A FLASH POINT LESS THAN 22.8 C (73 DEG. F) (CONTAINS ISOPROPANOL) ORGANIC TITANATE FLAMMABLE LABEL ATTACHED UN 1993<br>TOTAL NET 2#<br>1-CARTON CONTAINING 4 - 8 OZ. GLASS BOTTLES PACKED IN 1-GALLON CAN WITH VERMICULITE IN CARTON.<br>S71- 07783 | FLAM. LIQUID | 300 | 1-LITER | | 60 |

Special Handling Information

I hereby certify that the contents of this consignment are fully and accurately described above by Proper Shipping Name and are classified, packed, marked labelled and in proper condition for carriage by air according to the current Edition of the IATA Restricted Articles Regulations and all carrier and governmental regulations I acknowledge that I may be liable for damages resulting from any mistatement or omission and I further agree that any air carrier involved in the shipment of this consignment may rely upon this Certification

4

| Name and full address of shipper | Name and title of person signing Certification |
|---|---|
| E.I. DuPONT DE NEMOURS CO. | OSCAR CATSCRATCH - SUPERVISOR |
| CHAMBERS WORKS | |
| DEEPWATER, NEW JERSEY | |
| Date<br>8/9/78 | Signature of the Shipper (see WARNING above)<br>Oscar Catscratch |

| Air Waybill No * | Airport of Destination* | Airport of Departure* |
|---|---|---|
| 009854 | NEDDLES, ARIZONA | WILMINGTON, DELAWARE |

Example of a **Shipper's Certification for Restricted Articles** for air shipments.

## STRAIGHT BILL OF LADING

**MEMORANDUM**

CUSTOMERS BARGE - OHIO BARGE LINE

RECEIVED AT CLAIRTON, PENNSYLVANIA DATE 7-17 19--

FROM UNITED STATES STEEL CORPORATION

CONSIGNED TO HERCULES INC.

DESTINATION DONORA STATE OF PENNSYLVANIA COUNTY OF WASHINGTON

ROUTE

IF CHARGES ARE TO BE PREPAID WRITE OR STAMP HERE, "TO BE PREPAID" COLLECT BARGE INITIAL AND NO. SOUTHERN BIG N

| NO PACKAGES OR PIECES | DESCRIPTION OF ARTICLES | WEIGHT | RATE |
|---|---|---|---|
| 1 Barge | ANHYDROUS AMMONIA | 950 | Tons |
| | NONFLAMMABLE GAS | | |
| | UN 1005 RQ | | |
| | C- 1404 | | |
| | FOR HELP IN CHEMICAL EMERGENCIES [illegible] CALL TOLL FREE [illegible] | | |
| | THIS IS TO CERTIFY THAT THE ABOVE NAMED MATERIALS ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELED AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE DEPARTMENT OF TRANSPORTATION | | |
| | C.L Jones | | |
| | ANHYDROUS AMMONIA- WARNING DANGEROUS CARGO | | |
| | NO VISITORS - NO SMOKING - NO OPEN LIGHTS | | |

THE PROPERTY DESCRIBED HEREON IN APPARENT GOOD ORDER, TO BE CARRIED TO THE DESTINATION SHOWN AND DELIVERED AS DIRECTED, SUBJECT TO TERMS OF EXISTING CONTRACT OF CARRIAGE.

UNITED STATES STEEL CORPORATION ______ AGENT

per N.Teach PER ______

Example of a **Dangerous Cargo Manifest** for water transportation.

## CHEMICALS-R-US INC.

IN CASE OF EMERGENCY CONTACT - CHEMTREC (800) 424-9300 OR JOHN SMITH AT CRUS, 1 MAIN STREET, OURTOWN, U.S.A. 1-800-123-4567

REFER TO LAST PAGE FOR IMMEDIATE ACTION

## MATERIAL SAFETY DATA SHEET

**SECTION I**

CHEMICAL NAME & SYNONYMS

Pyridine

TRADE NAME & SYNONYMS

Pyridine

| HAZARDOUS INGREDIENTS | CAS # |
|---|---|
| Pyridine > 98% | 110-86-1 |

| CAS # | NIOSH # |
|---|---|
| 110-86-1 | OR8400000 |

EMPIRICAL FORMULA
C5 H5 N

OSHA HEALTH HAZARDS

Irritant
Target Organs: Eyes; Kidneys; Liver; Central Nervous System

NOTE: This product contains Pyridine Which is subject to the reporting requirements of Section 313 of Title III of SARA of 1986 and 40 CFR Part 372.

**SECTION II--PHYSICAL DATA**

| | |
|---|---|
| BOILING POINT F: | 240 @ 760MM |
| MELTING POINT: | Freeze -42°C |
| VAPOR PRESS, MMHG: | 16 @ 20°C |
| VAPOR DENSITY AIR =1: | 2.72 |
| SOLUBILITY IN H20: | Completely |
| SPECIFIC GRAVITY H20=1: | .983 |
| BULK DENSITY: | Not Established |
| PERCENT, VOLATILE BY VOLUME %: | 100% |
| pH: | 10.4 AT 10% sol. |
| APPEARANCE & ODOR: | Water white liquid, obnoxious odor (sharp penetrating). |

**SECTION III--FIRE AND EXPLOSION HAZARD DATA** NFPA 2-4-0

FLASHPOINT (METHOD USED): 68°F CC Auto Ign. Temp: 900°F
FLAMMABLE LIMITS: @ 140°F LEL %: 1.8 UEL %: 12.4
EXTINGUISHING MEDIA: Carbon dioxide, dry chemical, alcohol foam
SPECIAL FIREFIGHTING PROCEDURES: Standard personal protective gear, as well as self-contained breathing apparatus.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Explosion hazard is severe when product is in a vapor form.
Vapors may travel to ignition source and flash back or cause explosion.

**SECTION IV--REACTIVITY DATA**

STABILITY CONDITIONS TO AVOID: Slowly darkens on exposure to light.
STABLE: X
HAZARDOUS POLYMERIZATION CONDITIONS TO AVOID: N.E.
MAY NOT OCCUR: X
INCOMPATIBILITY (MATERIALS TO AVOID): Exothermic reaction with acids, oxidizing agents.
HAZARDOUS DECOMPOSITION PRODUCTS: Emits toxic fumes of cyanides and possibly ammonia.

**SECTION V--HEALTH HAZARD DATA**

## EXPOSURE DATA

TARGET ORGANS: Eyes, Kidney, Liver, Central Nervous System.
ORAL INGESTION: $LD_{50}$:891 mg/kg rat; LDLO:500 mg/kg or human; NIOSH 1981-82.
EYE CONTACT: Rabbit: 2 mg severe irritant NIOSH 1981-1982.
SKIN CONTACT/ABSORB: Dermal $LD_{50}$: 1121 mg/kg rabbit NIOSH 1981-1982.
INHALATION: TWA: 5 ppm $LC_{50}$: 4,000 ppm 4 hours--rat. Allowable 8 hour exposure = 15 mg per cu. meter. Slight, allowable max. = 5 ppm. NIOSH 1981-82.

## SYMPTOMS AND EFFECTS

ORAL INGESTION: Central nervous system depression, possible kidney, liver damage, and gastrointestinal upset.

EYE CONTACT: Burning, swelling, conjunctivitis & possible eye damage. Severe irritant.

SKIN CONTACT/ABSORB: Rabbit 10 mg/24/H Mild irritant; TLV 5 ppm (Skin). Can cause burning sensation, irritation and redness.

INHALATION: Central nervous system depression, gastrointestinal disturbances.

## FIRST AID PROCEDURES

ORAL INGESTION: Dilute by drinking water or milk (milk will help coat stomach) or neutralize by drinking a dilute solution of 3% citric acid. Seek medical attention immediately.

EYE CONTACT: Flush with water immediately for at least 15 minutes. See eye doctor immediately.

SKIN CONTACT/ABSORB: Remove contaminated clothing. Wash area with water and/or neutralize with 3% acid solution preferably citric. Seek medical attention.

INHALATION: Move victim to well ventilated area. If breathing is difficult give oxygen. If breathing stops, give artificial respiration. If patient is conscious, give milk. Seek medical advice.

### SECTION VI--SPILL OR LEAK PROCEDURE

CLEAN-UP PROCEDURE: Eliminate all ignition sources, contain spill. Use absorbent to collect spill, use water to dispose vapors and wash down area. (Keep water to a minimum.) Prevent runoff from entering drains, sewers, and waterways.

WASTE DISPOSAL METHOD: Dispose in accordance with all applicable Federal, State, and local regulations.

### SECTION VII--SPECIAL PROTECTION INFORMATION

| | | | |
|---|---|---|---|
| RESPIRATOR: | When cleaning up spills | | |
| VENTILAT. | LOCAL EXHAUST: X | SPECIAL: | Goggles |
| | MECHANICAL (GENERAL): X | OTHER: | Faceshield |
| GLOVES: | PVC gloves | EYE PROT: | Saf. glasses/goggles |
| OTHER: | As needed, plastic apron, etc. | | |

### SECTION VIII--SPECIAL PRECAUTIONS

HANDLING AND STORING: Flammable material store appropriately. See Section VII before handling. Keep away from heat, sparks and flame. Containers should be grounded to reduce the risk of spark by static electricity.

OTHER:

**SECTION IX--SHIPPING**

DOMESTIC: Pyridine - Flammable Liquid UN# 1282
INTERNATIONAL: Pyridine - Flammable Liquid, Poison, Corrosive
IMCO Class 3.2 UN# 1282

## EMERGENCY ACTION

DOT ERG--1990, REF. #26 (UN# 1282): Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

ISOLATE FOR 1/2 MILE IN ALL DIRECTIONS IF TANK, RAILCAR, OR TANK TRUCK IS INVOLVED IN FIRE.

CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE.

If water pollution occurs, notify the appropriate authorities.

The information and recommendations contained in this Chemical Safety Data Sheet have been compiled from sources believed to be reliable and to represent the best opinions published as of 10/23/89

__________________________
Manager, Safety and Health

N.E. = Not Established N.A. = Not Applicable

## CHEMICALS-R-US INC.

IN CASE OF EMERGENCY CONTACT--CHEMTREC (800) 424-9300 OR JOHN SMITH AT CRUS, 1 MAIN STREET, OURTOWN, U.S.A. 1-800-123-4567

## MATERIAL SAFETY DATA SHEET

**SECTION I**

CHEMICAL NAME & SYNONYMS — OSHA HEALTH HAZARDS

TRADE NAME AND SYNONYMS — EMPIRICAL FORMULA

HAZARDOUS INGREDIENTS — CAS # — NIOSH #

**SECTION II--PHYSICAL DATA**

BOILING POINT F:
MELTING POINT:
VAPOR PRESS, mmHg:
VAPOR DENSITY AIR =1:
SOLUBILITY IN H20:
SPECIFIC GRAVITY H20=1:
BULK DENSITY:
PERCENT, VOLATILE
BY VOLUME %:
pH:
APPEARANCE & ODOR:

## SECTION III--FIRE AND EXPLOSION HAZARD DATA

FLASHPOINT (METHOD USED):
FLAMMABLE LIMITS: LEL %: UEL %:
EXTINGUISHING MEDIA:
SPECIAL FIREFIGHTING
PROCEDURES:
UNUSUAL FIRE AND
EXPLOSION HAZARDS:

## SECTION IV--REACTIVITY DATA

STABILITY CONDITIONS TO AVOID:
STABLE: UNSTABLE:
HAZARDOUS POLYMERIZATION CONDITIONS TO AVOID:
MAY OCCUR: MAY NOT OCCUR:

INCOMPATIBILITY (MATERIALS TO AVOID):

HAZARDOUS DECOMPOSITION PRODUCTS:

## SECTION V--HEALTH HAZARD DATA

### EXPOSURE DATA

TARGET ORGANS:
ORAL INGESTION:
EYE CONTACT:
SKIN CONTACT/ABSORB:
INHALATION:

### SYMPTOMS AND EFFECTS

ORAL INGESTION:

EYE CONTACT:

SKIN CONTACT/ABSORB:

INHALATION:

## FIRST AID PROCEDURES

ORAL INGESTION:

EYE CONTACT:

SKIN CONTACT/ABSORB:

INHALATION:

**SECTION VI--SPILL OR LEAK PROCEDURE**

CLEAN-UP PROCEDURE:

WASTE DISPOSAL METHOD:

**SECTION VII--SPECIAL PROTECTION INFORMATION**

RESPIRATOR:

| | | |
|---|---|---|
| VENTILAT. | LOCAL EXHAUST: | SPECIAL: |
| | MECHANICAL (GENERAL): | OTHER: |

GLOVES: EYE PROT:

OTHER:

**SECTION VIII--SPECIAL PRECAUTIONS**

HANDLING AND STORING:

OTHER:

**SECTION IX--SHIPPING**

DOMESTIC:
INTERNATIONAL:

The information and recommendations contained in this Chemical Safety Data Sheet have been compiled from sources believed to be reliable and to represent the best opinions published as of

____________________________
Manager, Safety and Health

N.E. = Not Established N.A. = Not Applicable

# APPENDIX D

# REFERENCES AND RESOURCES

# REFERENCES AND PUBLICATIONS

## CODE OF FEDERAL REGULATIONS

For a summary, legal interpretation, or other explanation of any regulation, contact the issuing agency.

Inquiries concerning editing procedures and reference assistance with respect to the Code of Federal Regulations may be addressed to the Director, Office of the Federal Register, National Archives and Records Administration, Washington, DC 20308 (telephone 1-866-272-6272).

Sales are handled exclusively by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 (telephone 202-783-3238).

## FEDERAL REGISTER

For subscription to, or single copies of specific Federal Registers, contact the Superintendent of Documents as listed above.

For single copies of the Register, telephone 202-783-3238.

## INDIVIDUAL PUBLIC LAWS

For copies of individual Public Laws, contact the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9328.

## ADDITIONAL INFORMATION AND ASSISTANCE

| | |
|---|---|
| *Federal Register* | |
| Index, Finding Aids, and General Information | 202-523-5227 |
| Document Drafting Information | 202-523-5237 |
| Machine Readable Documents | 202-523-5237 |
| | |
| *Code of Federal Regulations* | |
| Index, Finding Aids, and General Information | 202-523-5227 |
| Printing Schedules | 202-523-3419 |
| | |
| *Public Laws* | |
| Public Laws Update Service | 202-523-6641 |
| Additional Information | 202-523-3419 |
| | |
| *Presidential Documents* | |
| Executive Orders and Proclamations | 202-523-5230 |
| Public Papers of the Presidents | 202-523-5230 |
| Weekly Compilation of Presidential Documents | 202-523-5230 |

| | |
|---|---|
| *The United States Government Manual* | |
| General Information | 202-523-5230 |

## OTHER SERVICES

| | |
|---|---|
| Legal Staff | 202-523-4534 |
| Library | 202-523-5240 |
| Privacy Act Compilation | 202-523-3187 |
| Public Law Update Service (PLUS) | 202-523-6641 |
| TDD for the Deaf | 202-523-5229 |

## PLANNING GUIDES AND DOCUMENTS

Documents available through the National Response Team by writing:

Hazardous Materials Emergency Planning Guide
OS-120
401 M Street, SW
Washington, DC 20460

1. **Hazardous Materials Emergency Planning Guide (NRT-1)**.

2. **Technical Guidance for Hazards Analysis - Emergency Planning for Extremely Hazardous Substances**.

Documents available through the Federal Emergency Management Agency (FEMA) by writing:

Federal Emergency Management Agency
Publications Office
500 C Street, SW
Washington, DC 20472

1. **Guide for Development of State and Local Emergency Operations Plans** (CPG 1-8).

2. **Review of State and Local Emergency Operations Plans** (CPG 1-8A).

3. **Hazardous Materials Contingency Planning Course** (student manuals).

4. **Disaster Planning Guidelines for Fire Chiefs**.

5. **Disaster Operations: A Handbook for Local Government**.

Documents available through the U.S. Department of Transportation (DOT) by writing:

Office of Hazardous Materials Transportation
Attention:  DHM-50
Research and Special Programs Administration
Department of Transportation
400 7th Street, SW
Washington, DC  20590

**Community Teamwork:  Working Together to Promote Hazardous Materials Transportation Safety--A Guide for Local Officials**.

Other U.S. DOT Publications available by writing:

National Technical Information Service
5285 Port Royal Road
Springfield, VA  22161

1. **A Community Model for Handling Hazardous Materials Transportation Emergencies**.

2. **Risk Assessment Users Manual for Small Communities and Rural Areas**.

3. **Manual for Small Towns and Rural Areas to Develop a Hazardous Materials Plan:  With an Example Application of the Methodology in Developing a Generalized Emergency Plan for Riley County, Kansas** (the Kansas Model).

4. **Community Model for Handling Hazardous Materials Transportation Emergencies:  Executive Summaries**.

5. **Hazardous Materials Demonstration Project Report:  Puget Sound Region**.

6. **Lessons Learned:  A Report on the Lessons Learned From State and Local Experiences in Accident Prevention and Response Planning for Hazardous Materials Transportation**.

Publications available through the U.S. Environmental Protection Agency by writing:

Environmental Protection Agency
OS-120
401 M Street, SW
Washington, DC  20460

1. **Introduction to Exercise in Chemical Emergency Preparedness Programs**.

2. **A Guide to Planning and Conducting Table-Top Exercises**.

3. **A Guide to Planning and Conducting Field Simulation Exercises**.

4. **Report of a Conference on Risk Communication and Environmental Management**.

5. **Identifying Environmental Computer Systems for Planning Purposes**.

6. **Chemicals in Your Community**.

Publications available through the Chemical Manufacturers Association by calling (202) 887-1100 or writing:

Publications Fulfillment
Chemical Manufacturers Association
1300 Wilson Blvd.
Arlington, VA 22209

1. **Community Awareness and Emergency Response Program Handbook**.

2. **Site Emergency Response Planning**.

3. **Community Emergency Response Exercise Program**.

Publications available through the American Institute of Chemical Engineers (AIChE) by writing:

AIChE Publications Sales Department
3 Park Avenue
New York, NY 10016-5991

1. **Guidelines for Hazard Evaluation Procedures**.

2. **Guidelines for Safe Storage and Handling of High Toxic Hazard Materials**.

3. **Guidelines for Use of Vapor Cloud Dispersion Models**.

4. **Guidelines for Vapor Release Mitigation**.

5. **Guidelines for Chemical Process Quantitative Risk Assessment**.

6. **Guidelines for Technical Management of Chemical Process Safety**.

7. **Guidelines for Obtaining Process Equipment Reliability Data**.

8. **Guidelines for Human Reliability in Process Safety**.

9. **Guidelines for Process Control Safety**.

10. **Guidelines for Processing and Handling Reactive Chemicals**.

## PUBLISHED RESOURCES

Department of Transportation, *Emergency Response Guide Book*, DOT P 5800.5, 2000.

Sometimes considered the "Bible" for hazardous materials initial response, this concise reference document is probably the most widely distributed haz mat publication in the country.  Chemicals can be identified by the 4-digit number on a placard or orange panel, by the 4-digit number (after UN/NA) on a shipping paper or package, or by name of the material on a shipping paper, placard, or package.  Responders can then look up one of 61 guides to find information on potential hazards (fire and health) and appropriate emergency actions for the chemical.  A table of initial isolation and protective action distances is also provided.

*NIOSH/OSHA Pocket Guide to Chemical Hazards*, Department of Health and Human Services/Department of Labor, June 2000.

Presents information taken from the NIOSH/OSHA Occupational Health Guidelines in a tabular format for ease and convenient use as a quick reference source relating to industrial hygiene and medical surveillance practices.  The information elements contained in the *Guide*, covering 380 chemical hazards, include

- chemical names and synonyms;
- permissible exposure limits;
- chemical and physical properties;
- signs and symptoms of overexposure;
- environmental and medical monitoring procedures;
- respiratory and personal protective equipment use recommendations; and
- procedures for emergency treatment.

National Fire Protection Association, *Fire Protection Guide on Hazardous Materials*,11th Edition, 2001.

The *Guide* can be used to identify the hazardous properties of most of the chemicals in commercial use today.  It is particularly useful to help fire and police department personnel take proper steps to prevent fires and other emergencies during the use, storage, and transportation of chemicals, and to make informal decisions on the procedures to be followed in an emergency.  The *Guide* contains an alphabetical listing of key topics that may be referred to in an emergency.

Hawley, Gessner G.  *The Condensed Chemical Dictionary*, Van Nostrand Reinhold Company, New York, 1997 13th edition.

This revised compendium of technical data and descriptive information covers thousands of chemicals and chemical phenomena, while including additional information on chemical manufacturing equipment and its components, energy sources and their pollution, waste control, etc. Three distinct types of information are given:

- technical descriptions of chemicals, raw materials, and processes;
- expanded definitions of chemical entities, phenomena, and terminology; and
- descriptions or identifications of a wide range of trademarked products used in the chemical industries.

Department of Transportation, *CHRIS Hazardous Chemical Data*, 2001.

The CHRIS (Chemical Hazard Response Information System) manual contains a condensed guide to chemical hazards designed to help personnel make the proper response in an emergency situation. It is intended for use by safety personnel and others who may be the first to arrive at the site of an accidental discharge or fire and who need readily available and easily understood information about the hazardous properties of the chemical involved.

Other components of CHRIS include

- *Hazardous Chemical Data Manual* with detailed chemical, physical, and biological data;
- *Response Methods Handbook* which describes cautionary and corrective response methods for reducing and eliminating hazards that result from chemical discharge; and
- computerized version of the *Hazard Assessment Handbook*.

Association of American Railroads, Bureau of Explosives, *Emergency Handling of Hazardous Materials in Surface Transportation.*

Contains over 500 pages of commodity-specific emergency response and environmental containment information on thousands of chemicals listed alphabetically. Descriptions include emergency procedures under different conditions (e.g., if on fire or not) and personal protection measures. Also includes recommendations for response: general rules and rules keyed to specific DOT hazard classes.

Sax, N. Irving. *Dangerous Properties of Industrial Materials*, Van Nostrand Reinhold Company, 2000.

This large reference volume provides a single source for quick, concise hazard-analysis information for nearly 15,000 common industrial laboratory materials. Includes flammability and explosion data, basic toxologic information, fire extinguishment materials, chemical incompatibilities, ventilation procedures and more. The book also contains a series of papers or related topics written by experts in the field.

Clayton, George D. and Florence E. Clayton, Editors. *Patty's Industrial Hygiene and Toxicology*, John Wiley and Sons, New York, 2000.

This major reference book for the occupational health field is in three volumes: General Principles, Toxicology, and Theory and Rationale of Industrial Hygiene Practice. The work includes contributions by recognized authorities in fields such as air pollution, agricultural hazards, odors, heat stress, industrial sanitation, fire and explosion hazards, atmospheric contaminants, epidemiology, lighting, and radiation.

## HAZARDOUS MATERIALS AND RELATED INFORMATION RESOURCES

### (Selected Listing)

CHEMTREC
1300 Wilson Blvd.
Arlington, VA 22209
(800) 262-8200

National Response Center
United States Coast Guard and EPA
(800) 424-8802
www.nrc.uscg

Centers for Disease Control
(404) 633-5313

Poison Control Center
Charleston, SC
(800) 222-1222

American Insurance Assn. (AiA)
1130 Connecticut Avenue, NW
Suite 1000
Washington, DC 20036
(800)-828-7100
www.aiadc.org

American National Standards Inst.
1819 L Street, NW, Suite 600
Washington, DC
(202) 293-8020
www.ansi.org

American Petroleum Inst. (API)
1220 L Street, NW
Washington, DC 20005
(202) 682-8517
www.api.com

American Soc. of Mechanical Engrs.
United Engineering Center
Three Park Ave.
New York, NY 10016
(212) 591-7722

American Trucking Assns.
2200 Mill Road
Alexandria, VA 22314-4677
(703) 838-1700

Bureau of Explosives
50 F Street, NW
Washington DC
(800) 933-4882
www.aar.com/boe

Canadian Trucking Assn.
130 Albert St., Suite 300
Ottawa ONT KIP 5G4, Canada
(613) 236-9426

CHRIS
U.S. Coast Guard Ntl. Resp. Ctr.
(202) 267-2229

Chemical Manufacturers Assn.
2501 M Street, NW
Washington, D.C. 20037
(202) 887-1272

Chemical Waste Trans. Institute i
1730 Rhode Island Ave., NW
Suite 1000
Washington, DC 20036
(202) 659-4613

Chlorine Institute, The
1300 Wilson Blvd.
Rosslyn, VA 22209
(703) 741 5760
www.cl2.com

Compressed Gas Assn.
4221 Walney Rd., 5th Floor
Chantilly, VA 20151-2923
(703) 788-2700
www.cganet.com

DOW Chemical Company
2030 Dow Center
Midland, MI 48674
(989) 636-1000
www.dow.com

Assn. of American Railroads (AAR)
50 F Street, NW
Washington, DC 20001-1564
(202) 639-2100
www.aar.org

DuPont Company
1007 Market Street
Wilmington, DE 19898
800-441-7515
www.dupont.com

Energy Research Development Adm.
Albuquerque Operations Office
Albuquerque, NM 87101
(505) 296-6226

Environmental Protection Agency (EPA)
1200 Pennsylvania Ave., NW
Washington, DC 20460
(202) 260-2090

Factory Mutual Engineering Corp. Lab
1150 Boston-Providence Turnpike
Norwood, MA 02062
(617) 762-4300

Federal Highway Administration
400 Seventh Street, SW
Washington, DC 20590
(202) 366-4000
www.fhwa.dot.gov

Fertilizer Institute, The (TFI)
820 First Street, NE,
Union Center Plaza, Suite 430
Washington, DC 20002
(202) 962-0490
www.tfi.org

National Assn. of Solvent Recyclers
Suite 1100
1333 New Hampshire Ave., NW
Washington, DC 20036
(202) 833-1294
www.naroil.com

Dept. of Transportation
U.S. Material Transportation Bureau
Off. of Hazardous Matls. Oprns.
400 Seventh St., SW
Washington, DC 20590
(202) 366-4000
www.usdot.gov

National Inst. for Occupational
Safety & Health (NIOSH)
4676 Columbia Parkway
Cincinnati, OH 45226
(513) 533-8302

National Private Truck Council
2200 Mill Rd., Suite 350
Alexandria, VA 22314
(703) 683-1300
www.nptc.org

National Propane Gas Assn.
1150 17th Street, NW Suite 310
Washington DC 20036
(202)-466-7200
www.npga.org

National Tank Truck Carriers
2200 Mill Road
Alexandria, VA 22314
(703) 838-1960
www.nttc.org

National Transp. Safety Board
(NTSB)
490 L'Enfant Plaza, SW
Washington, DC 20594
(202) 314-6000
www.ntsb.gov

Occupational Safety & Health Adm.
(OSHA)
200 Constitution Ave., NW
Washington, DC 20210
www.osha.gov

National Institute of Standards and Technology
100 Bureau Drive
Gaithersburg, MD 20899-3460
(301)-975-6478

U.S. Dept. of Commerce
Washington, DC 20234
(301) 921-1000

National Safety Council
1121 Spring Lake Drive
Itasca, IL 60143-3201
(630) 285-1211
www.nsc.org

Truckload Carriers Association
2200 Mill Road
Alexandria, VA 22314
(703) 838-1950
www.truckload.org

Society of Independent Gasoline Marketers of America
Suite 590
11911 Freedom Drive
Reston, VA 20190
(703) 709-7000

U.S. Nuclear Regulatory Commission (USNRC) Office of Public Affairs
Washington, DC 20555
(301) 415-8200
www.nrc.gov

Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402
(202) 512-1530
www.gpo.access.gov

National Fire Protection Assn.
1 Batterymarch Park
Quincy, MA 02169-7471
(617) 770-3000
www.nfpa.org

Federal Motor Carrier Safety Admin.
400 Seventh Street, SW
Washington, DC 20590
(202) 366-4000
www.dot.gov

Petroleum Marketers Association of America
1901 N. Fort Myers Drive
Suite 500
Arlington, VA 22209-1604
(703) 351-8000
www.pmaa.org

RSPA/Office of Haz Mat Trans.
400 Seventh Street, SW
Washington, DC 20590
(202) 366-0656
www.dot.gov

U.S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585
(202) 586-5000
www.doe.gov

# APPENDIX E

# ASSISTANT SAFETY OFFICER FOR HAZARDOUS MATERIALS

# CHECKLIST

## Checklist Use

The checklist should be considered as a minimum requirement for this position. Users should feel free to augment this list as necessary.

## Assistant Safety Officer--Hazardous Materials Checklist

1. Obtains briefing from the Incident Safety Officer.

2. Obtains briefing from the Hazardous Materials Group Supervisor.

3. Participates in the preparation of and implements the Site Safety Plan.

4. Advises the Hazardous Materials Group Supervisor (or Hazardous Materials Branch Director) of deviations from the Site Safety Plan or any dangerous situations.

5. Has full authority to alter, suspend, or terminate any activity that may be judged to be unsafe.

6. Ensures the protection of the Hazardous Materials Group personnel from physical, environmental, and chemical hazards/exposures.

7. Ensures provision of required emergency medical services for assigned personnel and coordinates with Medical Unit Leader.

8. Ensures that medical related records for the Hazardous Materials Group personnel are maintained.

9. Maintains Unit Log.

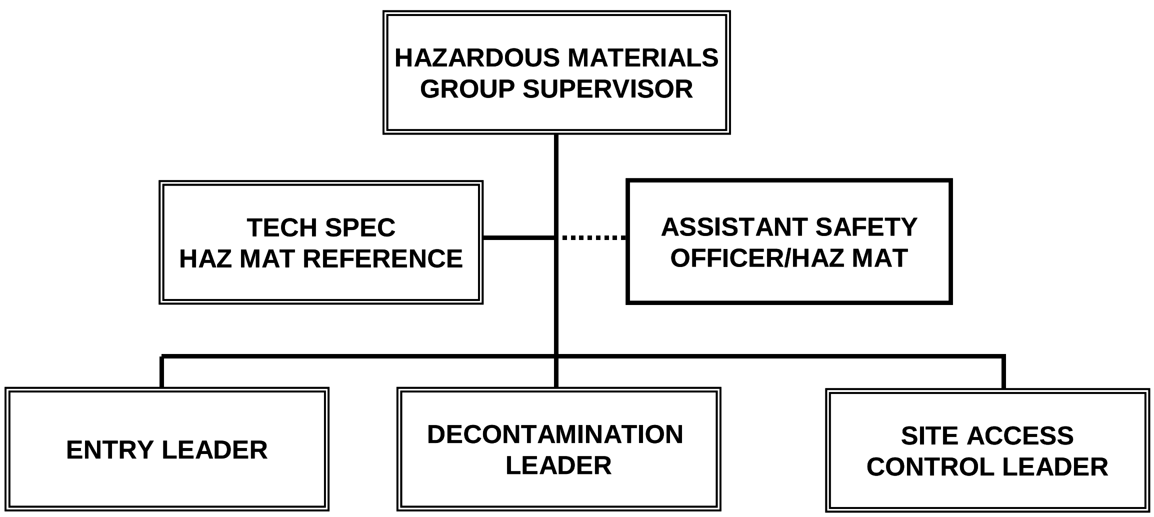
## ORGANIZATION, PERSONNEL, RESPONSIBILITIES, AND PROCEDURES

### Organization

The Assistant Safety Officer--Hazardous Materials reports directly to the Incident Safety Officer.  The Assistant Safety Officer--Hazardous Materials is assigned to the Hazardous Materials Group (or Hazardous Materials Branch if activated).  This position is responsible for the overall safety of assigned personnel within the Hazardous Materials Group.  The Assistant Safety Officer--Hazardous Materials coordinates group activities with the Hazardous Materials Group Supervisor.

In a multiactivity incident the Assistant Safety Officer--Hazardous Materials does not act as Safety Officer for the overall incident.  Therefore, it is necessary that an Assistant Safety Officer--Hazardous Materials be appointed at all hazardous materials incidents.

The Assistant Safety Officer--Hazardous Materials is positioned organizationally in the Hazardous Materials Group as illustrated.




### Personnel

The Assistant Safety Officer--Hazardous Materials coordinates activities directly relating to the Hazardous Materials Group operations as mandated by 29 CFR 1910.120.  This position advises the Hazardous Materials Group Supervisor on all aspects of health and safety and has the authority to stop or prevent unsafe acts.  Due to the responsibilities of this position, it is imperative that the individual be both Safety Officer qualified and possess a high degree of knowledge in hazardous substance mitigation operations and procedures.  These abilities require that the personnel assigned to this position have a minimum equivalent training and expertise as mandated by Federal, State, and local laws to perform the responsibilities and procedures of this position.

## Major Responsibilities and Procedures

The major responsibilities of the Assistant Safety Officer--Hazardous Materials are stated below. Following each responsibility are procedures for implementing the activity. Users of this manual should feel free to augment this list as necessary. Note that some activities are one-time actions while others are ongoing or repetitive for the duration of the incident.

1. Check in and obtain briefing from the Incident Safety Officer.

   a. Complete Check-In List.

   b. If reporting directly to an assignment, check in via radio.

   c. Request and receive briefing which includes:

      - Incident Briefing Form or the equivalent information verbally.

      - Initial instructions concerning work activities.

   d. Obtain Incident Action Plan when available.

   e. Start Unit Log.

2. Obtain briefing from the Hazardous Materials Group Supervisor.

   a. Obtain information on Hazardous Materials Group tactics and strategy.

   b. Obtain names and contact information (locations, radio frequencies, etc.) for key personnel.

3. Participate in the preparation of and implement the Site Safety Plan.

   a. Survey site and review documentation (maps, aerial photographs, etc.)

   b. Review Base, Command Post, and Hazard Site Evacuation Plans.

   c. Review Medical Plan.

   d. Review Organization Chart.

   e. Review current weather data and future weather forecasts.

   f. Develop recommendations for Incident Action Plan and Site Safety Plan.

   g. Attend briefings and planning meetings.

4. Advise the Hazardous Materials Group Supervisor (or Hazardous Materials Branch Director if activated) of deviations from the Site Safety Plan or of any dangerous situations.

   a. Maintain expedient form of communication with Hazardous Materials Group Supervisor.

   b. Brief Hazardous Materials Group on known or foreseeable problems and possible mitigation measures.

   c. Conduct frequent and continuous visual inspections to ensure compliance with the Site Safety Plan.

5. Exercise full authority to alter, suspend, or terminate any activity that may be judged to be unsafe.

   a. Notify the Incident Safety Officer of altered, suspended, or terminated activities.

   b. Document attempted and completed communication relating to the use of this authority as soon as possible. Diagram, photograph, and obtain witnesses' names where possible.

6. Ensure protection of the Hazardous Materials Group personnel from physical, environmental, and chemical hazards/exposures.

   a. Review and approve recommendations for Personal Protective Equipment and procedures relating to known hazardous materials involved.

   b. Observe Group operations personally and conduct interviews with operating personnel.

   c. Evaluate hazardous materials site safety based upon visual inspections and site intelligence.

7. Ensure provision of required emergency medical services for assigned personnel and coordinate with the Medical Unit Leader.

   a. Maintain periodic communication with and review the Site Safety Plan with the Medical Unit Leader.

   b. Review Emergency Medical Management Protocol for a hazardous materials exposure with Medical Unit Leader.

   c. Review personnel, apparatus, and procedures provided for such protection, including standby EMS personnel, rescue devices, emergency field decontamination plan.

8. Ensure that medical related records for the Hazardous Materials Group personnel are maintained.

   Ensure that exposure records are completed and filed with Documentation Unit.

9. Maintain Unit Log.

   a. Record significant events or actions taken on the Unit Log.

   b. Submit Unit Log through supervisor to the Documentation Unit at the end of each operational period.

# APPENDIX F

# GLOSSARY OF ACYRONYMS

## GLOSSARY OF ACRONYMS

| | |
|---|---|
| **AFFF** | Aqueous Film Forming Foam--a type of water additive used for the extinguishing of flammable liquid fires and vapor suppression. |
| **AIChE** | American Institute of Chemical Engineers. |
| **ALS** | Advanced Life Support--level of emergency medical care typified by paramedic capabilities. |
| **ARCHIE** | Automated Response for Chemical Hazard Incident Evaluation --an IBM-compatible software program for use in hazard identification and analysis. |
| **BLS** | Basic Life Support--level of emergency medical care typified by emergency medical technician (EMT) capabilities. |
| **CAER** | Community Awareness and Emergency Response--a program developed by the Chemical Manufacturers Association (CMA) to foster community/industry integrated emergency planning. |
| **CAMEO** | Computer-Aided Management of Emergency Operations--an Apple-compatible software program for the storage and retrieval of preplan data and response activities. |
| **CAS** | Chemical Abstract Service--Division of the American Chemical Society for the collection, listing, and dissemination of chemical data. |
| **CAS Number** | Standard reference number assigned to chemical substances registered with the CAS. |
| **CEO** | Chief Executive Officer. |
| **CEPP** | Chemical Emergency Preparedness Program--an Environmental Protection Agency program designed to assist in the hazard and vulnerability analysis steps of emergency planning. Incorporated into SARA. |
| **CERCLA** | Comprehensive Environmental Response, Compensation, and Liability Act of 1980--the original Superfund Act, primarily aimed at hazardous waste site identification and clean up. |
| **CFR** | Code of Federal Regulations--a series of 50 different documents that contain **all** Federal government regulations. |

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| **CHEMTREC** | Chemical Transportation Emergency Center--24-hour-a-day emergency information and assistance center operated by the Chemical Manufacturers Association. Toll-free emergency number: (800) 424-9300. |
| **CHRIS** | Chemical Hazard Response Information System--a series of reference manuals used to provide emergency response information regarding chemical release emergencies, developed by the U.S. Coast Guard. |
| **CMA** | Chemical Manufacturers Association--industrial group composed of many of the largest chemical manufacturers in the country. |
| **CWA** | Clean Water Act of 1970. |
| **CPG** | Civil Preparedness Guide--series of Federal Emergency Management Agency documents, primarily dealing with planning and preparedness. |
| **CPG 1-8** | *Guide for the Development of State and Local Emergency Operations Plans.* |
| **CPG 1-8a** | *Guide for the Review of State and Local Emergency Operations Plans.* |
| **DOC** | Department of Commerce. |
| **DOD** | Department of Defense. |
| **DOE** | Department of Energy. |
| **DOL** | Department of Labor. |
| **DOT** | Department of Transportation. |
| **EBS** | Emergency Broadcast System--voluntary system of broadcast stations (television and radio) designed to disseminate emergency public information. |
| **EHS** | Extremely Hazardous Substances--approximately 350 chemicals with a very high degree of toxicity and the potential to cause severe damage should they be accidentally released - originally identified in the CEPP. |
| **EM** | Emergency Manager. |

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| **EMI** | Emergency Management Institute - branch of the Federal Emergency Management Agency (FEMA), located at the National Emergency Training Center, Emmitsburg, MD. Involved in the development and delivery of training programs involving emergency planning and preparedness. |
| **EMS** | Emergency Medical Services. |
| **EMT** | Emergency Medical Technician--a certified technician capable of injured victim assessment, triage, stabilization and transportation at the basic life support level (BLS). |
| **EOC** | Emergency Operations Center--a predetermined, protected site where governmental functions (overall management) and responsibilities will be carried out during a time of emergency. |
| **EOP** | Emergency Operations Plan--a plan designed to establish the specific procedures and approaches to be used in the management of an emergency situation. |
| **EPA** | U.S. Environmental Protection Agency. |
| **ERG** | Emergency Response Guide--basic emergency information guide, developed and published by the Department of Transportation, for emergency response personnel involved in hazardous materials incidents. |
| **ERT** | Environmental Response Team--a group of highly trained specialists located in Edison, NJ, and Cincinnati, OH, available to assist the On-Scene Coordinator (OSC) with analysis, evaluation, assessment, and cleanup technique information. |
| **ERT** | Emergency Response Team--designation often given to in-house emergency response teams for specific facility or industry. |
| **FEMA** | Federal Emergency Management Agency. |
| **GEDAPER** | A seven-step decisionmaking process for emergency operations. |
| **HACS** | Hazard Assessment Communication System - computerized data system (part of CHRIS) available through the National Response Center (NRC). |
| **HHS** | Department of Health and Human Services. |

**HIA** Hazard Identification and Analysis--a three-step process used to identify the type, magnitude, and location of hazards, vulnerable areas, and probability of an incident.

**HMTUSA** Hazardous Materials Transportation Uniform Safety Act 1990

**HVAC** Heating, Ventilating, and Air Conditioning--term commonly used to identify the air handling (heating, cooling, and ventilating) systems found within a structure.

**IC** Incident Commander--the individual in charge of the Incident Command System used to manage operational personnel.

**ICS** Incident Command System--an operational management system based upon the concepts of "span of control" and "functional responsibility."

**IDLH** Immediately Dangerous to Life and Health--a measure of toxicity of a substance--the concentration of a toxin that is capable of causing irreparable injury or death.

**IEMS** Integrated Emergency Management System.

**$LC_{50}$** Lethal concentration of an inhaled substance that kills 50 percent of the exposed animal population.

**$LD_{50}$** Lethal dose of an ingested substance that kills 50 percent of the exposed animal population.

**LEPC** Local Emergency Planning Committee--the local planning organization to be composed of a minimum of 15 members, established by SARA mandates (SARA sec. 301).

**MSDS** Material Safety Data Sheet--document containing specific information on the safe handling of chemicals in the work-place.

**NCP** National Contingency Plan--general name given to the National Oil and Hazardous Substance Contingency Plan. Establishes the National Response System (NRS), found in #40 CFR Part 300.

**NETC** National Emergency Training Center--FEMA's main training facility, located in Emmitsburg, MD. Home of the National Fire Academy (NFA), Emergency Management Institute (EMI), and the U.S. Fire Administration (USFA).

**NFA** National Fire Academy--a branch of FEMA located at the National Emergency Training Center, Emmitsburg, MD, involved in the development and delivery of training programs for individuals involved in fire suppression, prevention, education and enforcement activities, and emergency medical services (EMS).

**NFPA** National Fire Protection Association--professional organization dedicated to improving fire safety in this country. Involved in the development of many standards and training materials.

**NRC** National Response Center--established by the National Response Team (NRT) to provide a single call that can activate the National Response System (NRS). A 24-hour-a-day emergency notification and information center, it is funded by DOT and EPA, and manned by USCG and Marine Science Technicians. Toll-free number: (800) 424-8802.

**NRS** National Response System--the national chemical emergency response system developed through the National Contingency Plan.

**NRT** National Response Team--an organization consisting of representatives of 14 Federal agencies responsible for planning and coordination of chemical emergency response activities at the Federal level. Chaired by the EPA and Vice-chaired by USCG.

**NRT-1** *Hazardous Materials Emergency Planning Guide*--issued by the NRT to provide guidance for the development of State and local hazardous materials plans mandated in SARA Title III. It shows a Federal consensus of approach.

**NRT-1a** *Criteria for Review of Hazardous Materials Emergency Plans* --issued by the NRT to assist in the assessment of hazardous materials emergency plans that are developed.

**NSF** National Strike Force--present-day version of the original USCG Strike Teams. Two teams available to provide assistance to the OSC; particularly well suited to assist in marine releases. Located on the Pacific and Gulf coasts.

**OSC** Onscene Coordinator--predesignated, Federal representative found at the regional level. The OSC, either from EPA or USCG, provides Federal direction and coordination of response and cleanup activities.

**OSHA** Occupational Safety and Health Administration--agency established by the OSH Act of 1972 to provide for a safe and healthy workplace.

**PIAT** Public Information Assistance Team--public relations specialists available through the OSC, for the purpose of maintaining the release of public information.

**PEL** Permissible Exposure Limit--normally 8 hours, time-weighted average exposure level for employees. The average employee can be exposed to these concentrations and should suffer no ill effects.

**RCRA** Resource Conservation and Recovery Act of 1976--provides for the proper handling, use, and disposal of chemicals manufactured and used in this country. Commonly referred to as "cradle to grave" tracking of chemicals.

**RIA** Resource Identification and Analysis--a two-step process involving identification of available resources and determination of their capabilities.

**RRP** Regional Response Plan--response plan developed at the regional level to meet the needs of each region.

**RRT** Regional Response Team--13 regional teams composed of Federal and State representatives. One team for each of the 10 Federal regions, Alaska, the Pacific Basin, and the Caribbean.

**RQ** Reportable Quantities--the specified quantity of a particular hazardous substance that, if accidentally released, must be reported to the LEPC and the NRC (SARA sec. 304).

**SARA** Superfund Amendments and Reauthorization Act of 1986--the act that reauthorized the Comprehensive Emergency Response, Compensation, and Liability Act (CERCLA). Amendments and additional requirements to CERCLA included Title III, Emergency Response and Community Right-To-Know, and Title IV, Radon Gas and Indoor Air Quality Research.

**SERC** State Emergency Response Commission--a State-level body, designated by the governor, to develop State-level emergency response planning systems, including oversight and review of LEPC's and their plans (SARA sec. 301).

**SIC Code** Standard Industrial Classification Code--a standardized system for classifying industries by operational types. Those found in codes 20 through 39 are required to provide annual release information (SARA sec. 313).

**SOP** Standard Operating Procedure--a specific description of the functions and responsibilities that members of a given organization are assigned to fulfill. Upon review of an SOP, an individual will know specifically what duties he or she is to perform. When effectively developed and used, SOP's provide the basis for training programs.

**SSC** Scientific Support Coordinators--members of the OSC's staff who act as technical and scientific advisors, and contact for the scientific community.

**TLV** Threshold Limit Value--set of standards established by the American Conference of Governmental and Industrial Hygienists for workplace exposures. Values are time-weighted averages (average exposure concentration over a specific period of time). Several different types.

1. **TLV-ceiling--**maximum exposure to which an employee MAY NOT be exposed at any time, without appropriate protective equipment.

2. **TLV-STEL** (Short-Term Exposure Limit)--maximum exposure, which an employee can receive for no longer than 15 minutes.

3. **TLV-TWA** (Time-weighted Average)--average amount of exposure an individual can receive, 8 hours a day, over a 40-hour workweek, and suffer no ill effects.

**TPQ** Threshold Planning Quantity--the amount of extremely hazardous substances present at any one time, on the site, at or above which the facility must develop site-specific response plans (SARA sec. 302).

**TRQ** Threshold Reportable Quantity--specific quantities of substances, above which a facility must report. Two different types.

1. **Inventory Forms--**quantities of substances above which a facility must provide MSDS or inventories to the SERC, LEPC and local fire department (SARA sec. 312).

2. **Routine Release Reporting--**quantities of toxic substances used at a facility above which the facility is required to provide routine release information to the Administrator of EPA and a designated agent for each governor. The information shall be reported by July 1 of each year, for the preceding year (SARA sec. 313).

**USCG** United States Coast Guard.

**USFA** United States Fire Administration.