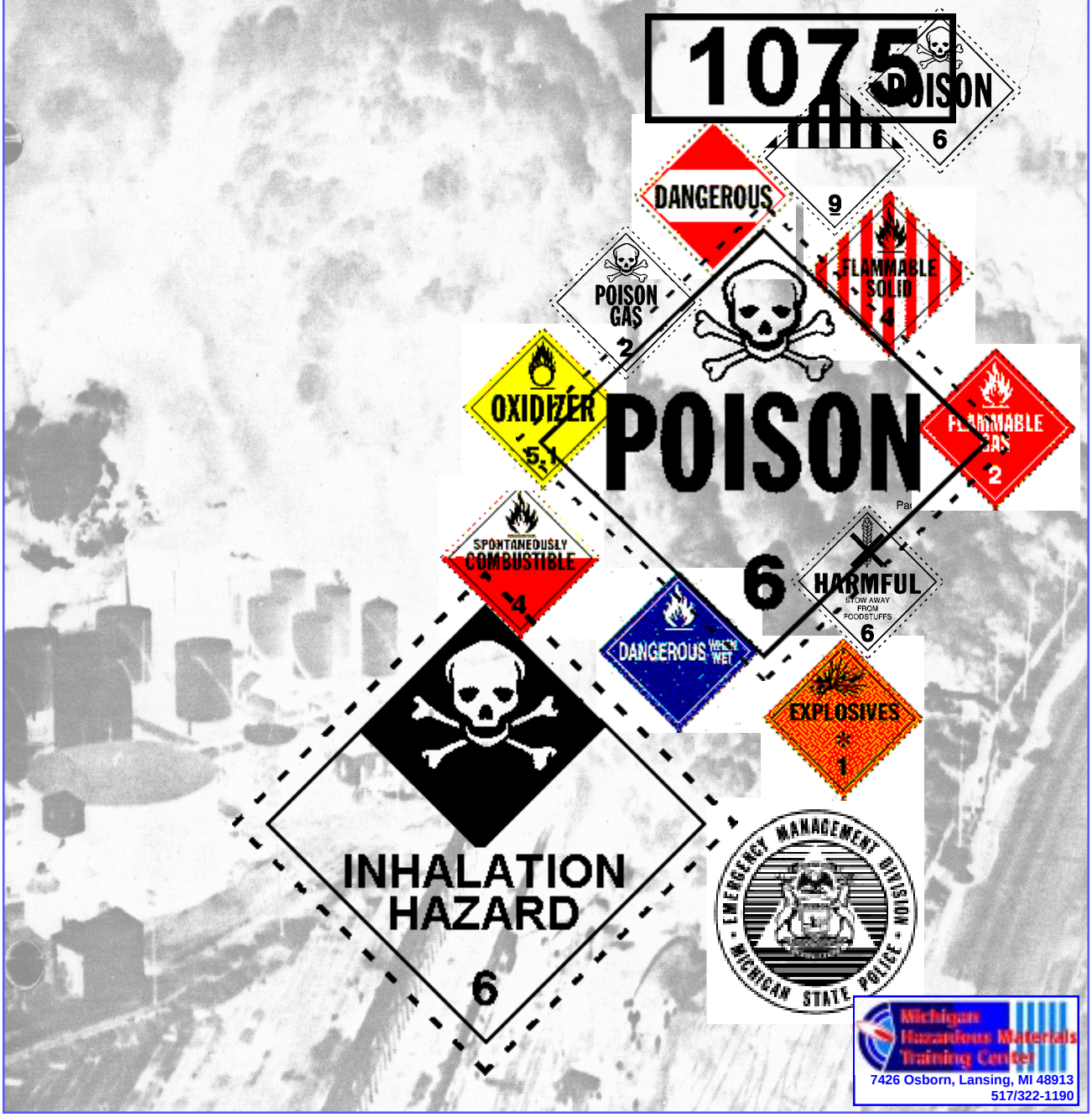
First Responder Awareness Training

For Hazardous Materials



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COURSE OBJECTIVES

After completion of this course the first responder should be able to:

1. Identify hazardous materials and the risks associated with them in a hazardous materials incident;

2. Identify the first responder's limitations in training and skills required for response to a hazardous materials incident;

3. Identify the response role of the Awareness-Level trained First Responder;

4. Identify types and locations of hazardous materials in the community;

5. Identify hazardous materials by using the U.S. Department of Transportation placarding and labeling system;

6. Use the North American Emergency Response Guidebook to aid in the handling of hazardous materials incidents;

7. Identify common resource organizations available to the first responder to aid in the mitigation of hazardous materials incidents;

8. Use rail consists, bills of lading, dangerous cargo manifests, air bills and material safety data sheets (MSDS) to aid in identifying hazardous materials and their properties;

9. Identify the types of locations that may become targets for criminal or terrorist activity using hazardous materials;

10. Identify indicators of possible criminal or terrorist activity involving hazardous materials; and

11. Identify the specific actions necessary when an incident is supected to involve criminal or terrorist activity.

PURPOSE STATEMENT

Hazardous materials surround us every day, everywhere. As emergency response personnel, it is likely that we will be the first to arrive at an incident involving hazardous materials. It is important for us to be aware of the types of hazardous materials transported and stored in our community, to know how terrorist activities can affect those locations, be able to identify unknown hazardous materials when encountered, and to know where and how to obtain expert help to assist us in the abatement of the hazardous condition caused by the incident.

The primary purposes of this course are:

1. To introduce industry and public service personnel to the "first responder" concept; and
2. To emphasize the importance of the first responder's safety at hazardous materials incidents, whether those incidents are intentional or accidental.

HANDS OFF!

HANDS OFF! A term strange to emergency responders. ***HANDS OFF!*** A term first responders must now learn to accept. ***HANDS OFF!*** A term that could make the difference between life and death when dealing with hazardous materials incidents. The time has come to take a ***HANDS OFF!*** approach when considering a rescue of a victim or victims who have been exposed and trapped in a hazardous materials environment, whether it is a transportation incident or on-site incident. Yes, the time has come for the potential first responder to admit that any rescue attempts in certain instances are not rescues of live victims but recovery of dead bodies with a high probability that the rescuer could add to the body count.

Difficult to accept? Absolutely! Difficult to implement? Definitely! Traditionally, as emergency response personnel handling various types of incidents, we have rushed in while everyone else rushed out. Although it is our nature to do so with all incidents, hazardous materials incidents must be different. We must be cautious and follow a ***HANDS OFF!*** approach until such time as the nature of the incident is clearly determined. In addition, the first responder must be aware of the ever increasing presence of clandestine drug manufacturing laboratories as well as frequently occurring terrorist activities. Both situations pose new and significant dangers to all involved.

HANDS OFF!
IT'S ESSENTIAL!
IT'S A MATTER
OF
LIFE
AND
DEATH!

Many first responders think they are capable of handling any hazardous materials incident which may occur in their jurisdiction. These same first responders feel obligated to the people in their organizations and communities to quickly handle any and all hazardous materials incidents which may occur, many times without additional help. However, the fact of the matter is that many of us are extremely limited in our ability to deal with these incidents. It is this limited ability that all response personnel must recognize, acknowledge and accept. The first responder's response plan for a hazardous materials incident must focus on the limitations of the organization as well as the individual responder. If responders can safely and effectively handle an incident within the boundaries of their limitations, they should do so. If not, the scene should be secured to assure the safety of the response personnel as well as the citizens located in the immediate area. Additional agencies and organizations such as a qualified hazardous materials response team should then be requested for assistance. The first responder may perform some limited tasks such as population protective actions as soon as the scene is secure, providing it is done in a safe manner. This may mean that any rescue attempt of trapped victims exposed to the hazardous materials is delayed until the arrival of the agencies capable of such a task. A ***HANDS OFF!*** approach must be initiated and maintained until the safety of response personnel can be assured. Emergency response personnel and organizations must accept the fact that, given these circumstances, trapped victims are beyond help.

We must accept the ***HANDS OFF!*** approach to handling hazardous materials incidents.

INTRODUCTION

We live in an industrial society. Chemicals have improved our standard of living and are a major part of our lives. But along with the benefits come risks. There are more than two million chemicals known to man. Many that sustain our quality of life also are hazardous to us when we are exposed at certain concentrations. Despite careful storage, packaging, handling and shipping precautions, accidental releases of hazardous materials occur frequently. Incidents involving hazardous materials may be very complex in nature and life threatening to responders and nearby populations. The purpose of this course is to provide you with an awareness of these dangers and with information to help you make proper initial decisions. This course will not make you an expert on hazardous materials. It is not designed to teach you how to handle hazardous materials. It is intended to provide you with the knowledge necessary to recognize the presence of hazardous materials, understand the dangers they present, and to take the appropriate initial action.

DEFINITIONS

What are hazardous materials?

A hazardous material is any substance in quantity or form that may pose an unreasonable risk to health, safety, or property. Hazardous materials in Canada are referred to as *Dangerous Goods.*

Extremely Hazardous Substance (EHS)

A list of substances as identified by the U.S. EPA which must be reported to the appropriate authorities if released above the established threshold reporting quantity (RQ). This list, with individual RQs, is published in the Emergency Planning and Community Right-to-Know Act (EPCRA). This law is also known as Title III of the Superfund Amendment and Reauthorization Act (SARA). Local Emergency Planning Committees need to develop response plans for the chemicals in their communities that are on this list.

Who is a "First Responder"?

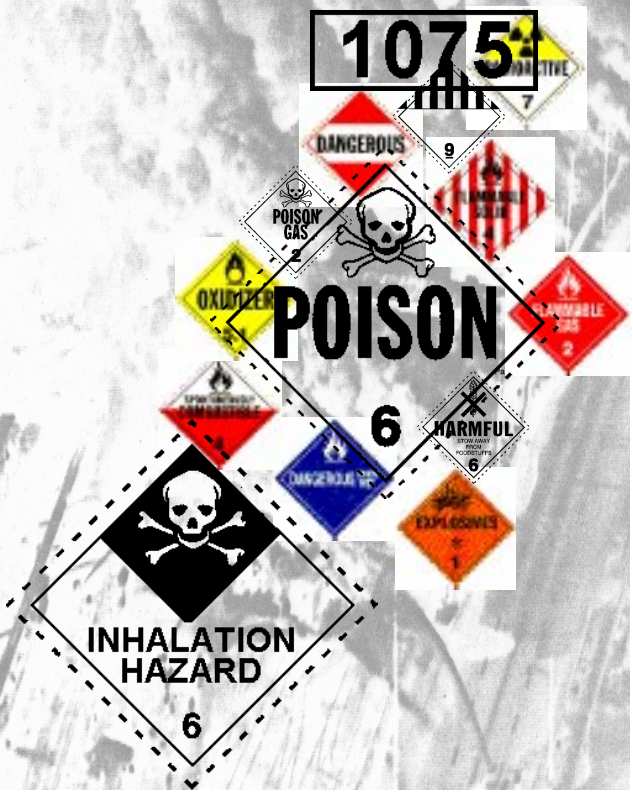
A "First Responder" is an individual who responds to an occurrence of a potentially uncontrolled release of a hazardous material. The individual's role is limited by level of training and resources available. On-site employees who respond to situations other than incidental spills and releases can be considered "First Responders".

What is terrorism?

The unlawful use of force against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in the furtherance of political or social objectives. (FBI)

UNIT ONE

Role and Responsibility of the First Responder



A. APPROACH AND DETECT THE PRESENCE OF HAZARDOUS MATERIALS

Approach the incident site with caution and only if safe approach avenues are available:

- from upwind, uphill, upstream, etc.,
- stop at a safe distance and use binoculars to size up the incident scene; observe markings, placards, or other clues

When approaching the scene of a hazardous material incident the first responder must be cautious, deliberate and aware that the incident could have been caused intentionally (terrorism) and would therefore be considered a crime scene. During our initial approach we need to be aware of clues that might indicate a crime has been committed and be sensitive to law enforcement's need for preservation of crime scene evidence. Physical evidence is usually the key to successful prosecution. Additionally, terrorists many times use techniques designed to delay the initial response, such as secondary explosive devices which target first responders and disrupt an otherwise normal response.

Clandestine drug manufacturing laboratories present similar problems to the first responder. We must be aware of the potential dangers when responding to an incident involving this type of operation. These "facilities" can be located anywhere, including highly populated areas as well as rural locations and should be approached with caution. Once again, a location involving this type of incident must be viewed as a crime scene.

B. IDENTIFY

Utilizing the clues and types of information discussed in Unit III, *Recognizing and Identifying Hazardous Materials*, attempt to identify the materials involved.

Some reference sources recommended for first responder use in identifying products and their hazards are:

- North American Emergency Response Guidebook (USDOT)
- Emergency Handling of Hazardous Materials in Surface Transportation (AAR)
- Condensed Chemical Dictionary (Hawley)
- Emergency Action Guides (AAR)
- Pocket Guide to Chemical Hazards (NIOSH)

C. COMMUNICATE

- Notify local Fire Dept., Police Dept., and E.M.S., (as necessary)
- Provide these agencies with as much information as can be gathered
- Communicate hazard information accurately. State chemical name, number of words in the name, and spell letter by letter

Example: *"first word A-N-H-Y-D-R-O-U-S, second word A-M-M-O-N-I-A"*

- Request the dispatcher to spell back the chemical name to ensure transmission accuracy
- Provide identification numbers (if available) as a cross check
- Describe site conditions as thoroughly as possible. Include:
  - Weather conditions and wind direction
  - Status of hazardous materials (stable, leaking, burning, etc.,)
  - Description of the area impacted (residential, commercial, industrial, environmentally sensitive, etc.,)

- Evaluation of biologic indicators (animals, vegetation)
- Indicate if victims are observed
- Advise dispatch or other communication contact, which agencies or resources may be needed. (HazMat team, DEQ, Public Health, etc.,)

> ***Note:*** *Several notifications must be made to meet various laws and regulations, however it should not be the responsibility of the First Responder - Awareness Level to fulfill these obligations. These notification requirements should be carried out by police/fire dispatch or other communication coordination entities.*

Examples: MSP Fire Marshal (via MSP Post) for fixed site incidents, MSP Motor Carrier Haz Mat Section (via MSP Post) for transportation incidents, CHEMTREC, National Response Center, Department of Environmental Quality Pollution Emergency Alerting System (PEAS), local LEPC coordinator, local emergency management coordinator, and MSP Emergency Management Division district coordinator (via MSP Post).

D. ESTABLISH INITIAL SCENE MANAGEMENT

- Secure the area surrounding the incident scene
- Direct non-essential personnel and the general public away from area
- Establish a secured zone around the incident scene and set up an access control point

E. INITIATE PROTECTIVE ACTIONS

Provided his/her individual safety is not jeopardized, the first responder may need to advise vulnerable populations near the incident to take appropriate protective actions.

- Door-to-door notification of homes and businesses in close proximity to the incident, if necessary
- Use warning sirens and mobile public address (PA) systems

F. BRIEF INCIDENT COMMANDER

The senior emergency response official responding to the emergency must establish an Incident Command System (ICS). That official is then in charge of the incident scene and must be briefed by the first responder. The information should include all that is known about the incident and a summary of the actions taken by the first responder.

UNIT TWO

Safety

Hazardous materials incidents differ from other emergencies in many ways. The first responder must be aware of these differences and be prepared to deal with them in an appropriate manner. In addition, we must be aware of the possibility of terrorist activities involving hazardous materials and understand that secondary explosive and release devices often target emergency responders. Clandestine drug labs can produce very toxic smoke when engulfed in fire, as well as be rigged with deadly booby traps and other hazards. The first responder must be careful to approach such a scene in a safe manner.

A. COMPLEXITY

The complexity of hazardous materials incidents can be much greater than other types of emergencies because they:

- Require extensive amounts of planning, education and training
- Require deliberate and cautious assessment prior to taking action
- Require specialized protective equipment

B. IMPACT

Hazardous materials incidents can have a tremendous impact on victims, responders, the community and the surrounding environment.

- Hazardous materials incidents will not go away without mitigation
- They present a large variety of risks to responders
    1. chemical exposure
    2. fire and explosion
    3. oxygen deficiency
    4. ionizing radiation
    5. biological hazards
- Rescue may be difficult, if not impossible
- Hazardous materials incidents create constraints of time and distance

C. POTENTIAL HARM

There are numerous ways hazardous materials incidents can be harmful to responders, including:

- thermal
- radioactive
- asphyxiation
- chemical
- etiological
- mechanical

When responding to "normal" hazardous materials incidents we could be faced with harmful effects which fall into any of these categories. However, terrorist incidents could be more complex and cause potential harmful effects in combination, such as chemical/thermal or etiological/radioactive. Additionally, the purpose of terrorism is to inflict psychological pain and trauma through shocking, sometimes catastrophic events. Terrorists may employ various methods of destruction including explosives, toxic substance releases and nuclear detonation devices. The first responder must be aware of the potential harmful effects of terrorist activities and respond cautiously to hazardous materials incidents, watching for indications of possible links to intentional releases.

Clandestine drug labs can cause physical harm to responders due to disguised holes cut in floors, hidden explosive devices, discarded needles, toxic vapors and other lethal dangers.

D. EXPOSURE

Exposures to hazardous materials can be either acute (short term) or chronic (long term). Both types of exposures can have acute or chronic affects. However, the threat of exposure during an accidental release can differ from that of an intentional release (terrorism). An intentional release of nuclear, biological or chemical materials can tremendously increase the potential for responder exposure. Because of the possibility of multiple substance releases and secondary devices as well as the basic underlying intent to do harm, the first responder must be even more cautious and vigilant when a terrorist incident is suspected. Some toxic substances have been specifically developed for inflicting mass casualties during wartime. These agents, such as **TABUN**, **SARIN** and **SOMAN** as well as others, can result in symptoms ranging from a runny nose to death and are considered available to many terrorist groups.

E. PROTECTIVE CLOTHING

Responders who face a potential exposure to hazardous materials must wear appropriate protection. The use of proper respiratory protective equipment and clothing is paramount. Street clothes and work uniforms will not provide protection from the hazards of harmful substances. Firefighter turnout gear does not provide chemical protection. Specialized chemical protective clothing is needed to protect an appropriately trained responder who is working in close proximity to a hazardous material spill or release. Responders exposed to hazardous materials must wear the appropriate respiratory protection, and be properly fitted and trained in the use of the respiratory equipment.

F. TOXICITY OF HAZARDOUS MATERIALS

Hazardous materials are considered to be toxic (poisonous) to people and other living organisms. The degree and type of toxicity varies for individual substances.

- Toxicity categories
  1. asphyxiation
  2. irritation
  3. allergic sensitization
  4. systemic poisoning
  5. mutagenesis
  6. teratogenesis
  7. carcinogenesis
- Routes of entry for human exposure
  1. inhalation (Breathing)
  2. absorption (Skin contact)
  3. ingestion (Swallowing)
  4. injection (Puncturing)

G. THREATS TO HEALTH, PROPERTY, AND THE ENVIRONMENT

- States of hazardous materials:
  1. solid
  2. liquid
  3. gas
- Dispersion pathways
  1. atmosphere
     vapor density of the material determines dispersion characteristics, heavy gases vs. lighter gases
  2. surface water
     specific gravity of the material determines dispersion characteristics, heavy liquids vs. lighter liquids
  3. soil
  4. ground water
- Reaction of hazardous materials released into the environment
  The type of area (terrain, climatic conditions) where a substance is released may affect the dispersion of that material, it may go nowhere.

  1. non-persistent once released, the toxicity of the substance may change via:
     a) dilution
     b) degradation

  2. persistent
     a) resists degradation
     b) requires specialized clean up procedures and equipment
     c) will find pathways to humans, i.e. water, food chain, etc.
     d) cumulative exposures may induce negative toxicological effects on humans and the environment

  3. reactive/incompatible
     Contact with the atmosphere or other materials may produce violent and/or toxic results.

H. POTENTIAL IGNITION SOURCES

- emergency response vehicles
- open flame, cigarettes, welding/cutting
- lightning, static charge (low humidity conditions)
- electrical sources
- radios and flashlights
- heat producing chemical reactions
- flares, etc.

I. OTHER HAZARDS

- traffic (emergency and civilian vehicles)
- electrical (down power lines)
- slip, trip, fall hazards
- booby traps

J. EMERGENCY MEDICAL CARE

- Hasty rescue should not be attempted
- The hazardous material should be known prior to rescue
- Responding personnel should have specific training in personal protective equipment (PPE), decontamination and medical treatment specific to hazardous materials exposure
- The appropriate personal protective equipment must be available

During a hazardous materials incident, the Awareness-Level First Responder may encounter contaminated or potentially contaminated non-ambulatory victims. The responder **must** remember to think "safety first" and not rush to aid the victim until steps are taken to render the action safe. As an EMS provider, the first responder may need to wait to receive a patient in the Cold Zone. Victims should be screened as soon as possible to determine vital signs, extent of injuries, and exposure details.

K. DECONTAMINATION/ISOLATION

First responders may encounter contaminated victims at a hazardous materials incident, and could potentially become contaminated themselves. In addition, equipment used in the response could also come in contact with contaminants. Individuals and equipment contaminated during an incident must be isolated from other people and property to minimize further contamination spread, and then properly decontaminated.

Contaminated victims with no life threatening injuries should be decontaminated by properly trained personnel. Appropriate preventative action must be taken to minimize contaminating transport vehicles and hospital emergency receiving areas. Awareness-Level First Responders are <u>not</u> to perform decontamination of personnel or equipment. However, a description of decontamination activities is provided to allow the first responder to become familiar with expected procedures. Below are the steps you might go through for contamination reduction.

- Washing/rinsing to remove gross contamination
- Removal of outer clothing
- Additional wash/rinse
- Medical surveillance/monitoring
- Transport to medical facility

Emergency response personnel who have been contaminated but are not in need of immediate medical attention, must report to the established decontamination area. Contaminated equipment, clothing, water and other materials must always be left in the decontamination area until the items can be properly decontaminated or disposed of.

The first responder should:

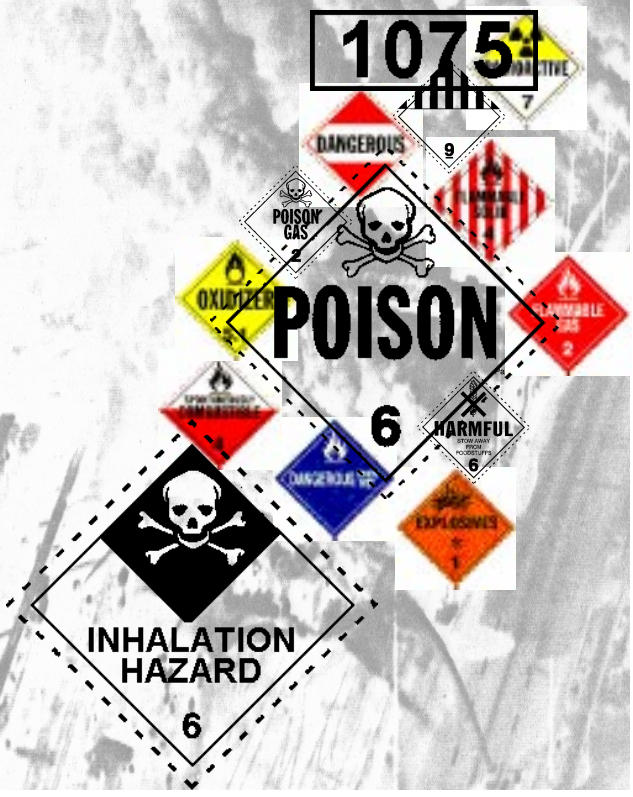
- notify designated decontamination personnel of the particular equipment that potentially has been contaminated

Decontamination personnel will:

- follow appropriate decontamination protocol of salvageable equipment
- provide for the proper containment and/or isolation of non-salvageable equipment subject to disposal

UNIT THREE

Recognition and Identification



A. CLUES FOR DETECTING HAZARDOUS MATERIALS PRESENCE

When responding to a hazardous materials incident there are a number of clues available to the first responder to aid in determining the presence of hazardous materials. These clues include:

1. Occupancy and/or location
2. Container shapes
3. Markings and colors
4. Placards and labels
5. Shipping papers
6. Senses

■ OCCUPANCY AND/OR LOCATION

Information on occupancy types and possible locations of hazardous materials are generally obtained in two ways: First, the responder should have a basic understanding of their response district or community. Second, the departments and agencies involved in hazardous materials response need to make pre-emergency visits or surveys of businesses that have a potential for accidental release of hazardous materials. Pre-emergency surveys should take place in an environment without stress or time constraints and during daylight hours. Pre-emergency surveys are the preferred method for obtaining information used to locate and identify hazardous materials in the community.

The first responder must be familiar with the Local Emergency Planning Committee (LEPC) and the facilities and transportation routes for which the LEPC has developed emergency response plans, and what the First Responder's role is as identified in the plans.

Material Safety Data Sheets (MSDSs) for chemicals at facilities in the community are available to certain local governmental agencies (fire departments, Local Emergency Planning Committees). MSDSs will provide you with chemical-specific information such as chemical properties, hazardous ingredients, toxicological effects, spill or leak procedures, special precautions, first aid, fire and explosion hazards, reactivity data, health hazard data, as well as manufacturer's name and telephone number.

■ CONTAINER SHAPES

One of the most important clues used to detect hazardous materials is the shape of the container. The general classifications of containers for hazardous materials are:

1. Individual Containers
2. Bulk Transport Containers
3. Bulk Storage Containers

Some hazardous materials require specialized containment that has a specific shape, which can give a clue to the identity of the contents. Regarding highway transportation, the size and shape of tank trucks can offer clues about the type of material being transported. These differences in shape are rather easy to spot.

The shape of the end of the tank offers the best clue. Generally, nonpressurized tank trucks have flat or nearly flat ends, while pressurized tank trucks have rounded ends. Some samples of characteristic shapes are:

1. Cylindrical or elliptical containers with flat or nearly flat ends contain liquids at atmospheric pressure (gasoline)
2. Cylindrical or elliptical containers with rounded ends contain gases under very high pressure (liquefied petroleum gas)
3. Rail tank cars with dome fittings totally enclosed with a large cap, contain liquid under very high pressure (liquefied petroleum gas)

Note: *Some retrofitting of rail tank cars may give the appearance of rounded ends, but are not high pressure containers. See Attachment F for more information on cargo tanks.*

■ MARKINGS AND COLORS

There are unique markings and colors used to indicate the presence of hazardous materials. Some hazardous materials must be identified by proper shipping name on the side of the container, as required by law. Company names, logos, and addresses of shippers and consignees may provide clues to the presence and identification of hazardous materials.

- Identification numbers

Identification numbers are designed to identify hazardous materials in transportation. These numbers must be displayed on cargo tanks, portable tanks, rail tank cars, and certain small packages carrying hazardous materials. They may also be displayed on other conveyances as well.

Rail tank cars have a unique marking system consisting of a combination of letters and numbers. The railroads call these letters and numbers reporting marks. The letters identify the owner of the car and the numbers identify the individual car. A single rail car number can identify the entire train and contents through the rail company.

Methods used to display identification numbers on packages and containers include rectangular orange panels and diamond shaped placards and labels which utilize a specific color scheme.

1. Orange panel adjacent to the placards. Panel is 6-1/4" x 15-3/4" with 4-inch numerals

2. Placard/label

3. NFPA 704M

The National Fire Protection Association has developed a marking system for identifying hazardous materials at terminals and industrial sites. This method is not used in transportation, although these markings may be found on small packages or containers. See Attachment B for more information on the NFPA 704M marking system.

4. Hazardous Materials Identification System (HMIS)

The Hazardous Materials Information System is an automated repository of Material Safety Data Sheets (MSDS), transportation, label, and disposal information. HMIS provides an organization a tool for use in complying with hazard communication requirements. Over 20,000 employers currently use this voluntary system. The HMIS label is similar to the NFPA 704M marking system, using the same color and numbering scheme. However, the information is displayed in an horizontal fashion with personal protection information included. (See Attachment C).

■ PLACARDS AND LABELS

Placards are diamond shaped, 10-3/4 inches square, and are required to be displayed on all four sides of a transport vehicle that is carrying hazardous materials, dependent upon the type and quantity of the material. The placard provides recognition information in a number of ways:

1. the colored background
2. the symbol at the top
3. the United Nations hazard class number at the bottom
4. the hazard class wording or the identification number in the center

Labels are similar to placards in appearance and must be securely affixed to packages containing hazardous materials, depending upon type and quantity. The label should be located near the proper shipping name and must not be obscured by other markings.

Colors, symbols and numbers on both placards and labels provide the responder with a means of identifying the materials and their hazards.

■ COLORS

- orange indicates explosive
- red indicates flammable or combustible
- green indicates nonflammable gas
- yellow indicates oxidizing material
- white indicates toxic/poisonous material
- white with vertical red stripes indicates flammable solid
- yellow over white indicates radioactive material
- white over black indicates corrosive material
- blue indicates water reactive substances

NOTE: *Combustible placards which display the identification number may have a white area under the identification number display to differentiate them from flammable liquids.*

Symbols

Note: "Empty" and "residue" placards are no longer authorized for use. Containers must remain placarded until cleaned.

Hazard Class Numbers (with examples)

- Class 1 - Explosives (dynamite, black powder)
- Class 2 - Gases, compressed, liquefied (LPG)
- Class 3 - Flammable and combustible liquids (gasoline)
- Class 4 - Flammable solids (phosphorus)
- Class 5 - Oxidizing substances (hydrogen peroxide solution)
- Class 6 - Toxic or infectious substances (hydrocyanic acid, phosgene, anthrax, medical waste)
- Class 7 - Radioactive substances (plutonium, cobalt)
- Class 8 - Corrosive substances (sulfuric acid, caustic soda)
- Class 9 - Miscellaneous dangerous goods (hazardous wastes)

LIMITATIONS OF THE HAZARD CLASS SYSTEM

■ MULTIPLE HAZARDS:

Many hazardous materials have multiple hazards and are required to be placarded with a primary placard and subsidiary placard. The subsidiary placard will not display a hazard class number. When a material has more than one hazard, the primary placard to be used is determined by what DOT mandates as the most dangerous property. The most dangerous property is determined using the following ranking system:

1.	Radioactive	Class 7
2.	Poison Gas	Division 2.3
3.	Flammable Gas	Division 2.1
4.	Nonflammable Gas	Division 2.2
5.	Poisonous Liquids	Division 6.1 (inhalation only)
6.	Pyrophoric material	Division 4.2
7.	Self reactive material	Division 4.1
8.	Flammable liquid	Class 3
	Corrosive	Class 8
	Flammable solid	Division 4.1
	Spontaneously combustible material	Division 4.2
	Dangerous when wet material	Division 4.3
	Oxidizers	Division 5.1
	Poisonous liquids/solids	Division 6.1 (non inhalation hazard)
9.	Combustible liquids	Class 3
10.	Miscellaneous hazardous materials	Class 9

Example of a material with multiple hazards:

Nitric Acid, Red Fuming - UN 2032 This material is an oxidizer, corrosive, and a poison. It is placarded as a corrosive and a poison.

> ***Note:*** *It is common for a material to have more than one DOT shipping label on the container.*

■ UNDERSTATED HAZARDS:

Organic Peroxides are a good example of a type of material that has its hazards greatly understated. Organic peroxides are grouped into class 5 with oxidizers. These chemicals do release oxygen to support combustion, but the primary hazard is explosion. These materials are both fuel and oxidizer all in one, creating the threat of an explosion. Organic peroxides are unstable chemicals that should be treated like explosives in a fire or spill situation.

■ DEGREE OF HAZARD:

The degree to which a material is hazardous can vary greatly. The hazard class system does not provide a means to accurately gauge the degree of hazard.

*Note: Placarding is **always** required for the following types of hazardous materials regardless of the quantity of material:*

- *Explosives division 1.1, 1.2, 1.3*
- *Poison gas*
- *Water reactive materials*
- *Poison liquid with inhalation hazard*
- *Radioactive materials with yellow Class III labels*

LIMITATIONS OF THE UN/NA PLACARDING SYSTEM

■ DANGEROUS PLACARD

A freight container, unit load device, transport vehicle or rail car which contains non-bulk packagings with two or more categories of certain hazardous materials that require different placards may be placarded with DANGEROUS placards instead of the separate placarding specified for each of the materials. Therefore there is no way for the responder to know what hazards may be associated with the materials being transported.

■ WEIGHT EXCEPTION

A transport vehicle which contains less than 454 kg (1001 pounds) aggregate gross weight of hazardous materials is not required to display placards. Excepted from this rule are the materials which must always be placarded regardless of amounts.

- Explosives division 1.1, 1.2, 1.3
- Poison gas
- Water reactive materials
- Poison liquids with inhalation hazard
- Radioactive materials with yellow Class III labels

To the first responder, there is little difference between 1,005 pounds (502 kg) of a hazardous substance and 990 pounds (495 kg), with respect to threats to personnel and the environment.

■ UNCLASSIFIED MATERIALS AND EXEMPTIONS

Many materials do not require placarding due to regulation. However, some hazards may actually exist, such as the extreme cold associated with cryogenic materials. Additionally, many times substances once thought to be safe at one time are later determined to be hazardous.

Many specific substance exemptions are granted annually to manufacturers and shippers for many reasons including but not limited to economic considerations.

■ MULTIPLE HAZARDS

Numerous materials exhibit more than one hazard, however only the hazard considered the most dangerous is used to classify the substance for proper placarding.

■ DEGREE OF HAZARD

Unlike the NFPA 704M labeling system, this system does not provide the responder with an indication of the relative level of the hazard.

■ HUMAN ERROR

The shipper may at times neglect to change placards for each shipment or may incorrectly placard a load.

■ ENFORCEMENT

Enforcement of the regulations surrounding the transport of hazardous materials is a continual problem. It is virtually impossible for enforcement agencies to ensure compliance 100% of the time. Emergency response personnel must know that improperly marked, unmarked, and illegal shipments occur daily. Federal laws now govern interstate transports. Additionally, a carrier may intentionally obscure the presence of a hazardous material either to avoid regulation/enforcement for economic purposes, or to conceal illegal operations.

SHIPPING PAPERS

Hazardous materials are uniquely identified in shipping papers:

- Listed first on the shipping document
- May be highlighted by a different color
- Marked in special hazardous materials column

> ***Note:*** *The Standard Transportation Commodities Code is a unique seven digit number assigned to most materials and found in shipping papers. If a material is hazardous, the STCC number will begin with 49. (See examples of shipping papers in Attachment D.)*

■ MATERIAL SAFETY DATA SHEETS (MSDS)

Material Safety Data Sheets are not specifically a shipping paper, however MSDSs are often found attached to other shipping papers. Information which may be found on the MSDS includes:

- product identification
- physical properties
- fire and explosion hazard data
- product composition and exposure limits
- potential health effects
- emergency first aid procedures
- special protection information
- spill or leak procedures
- handling and storage precautions
- hazard warning

> ***Note:*** *See Attachment E for an example of an MSDS.*

■ SENSES

Your own senses - smell, sound, touch or sight - can also help you detect the presence of hazardous materials. Odors may indicate the presence of a hazardous material. Remember, if you can smell a hazardous material, it is time to get out. Odors such as rotten fruit or eggs, freshly cut grass, etc. are characteristics of certain hazardous materials. Many times, clandestine drug labs produce distinct odors dependent upon the materials and methods involved in manufacturing the illegal drugs. Operators of these labs frequently locate the facility in areas such as farms that provide natural odors for masking purposes. Some chemicals can rapidly desensitize your sense of smell. You may not be able to smell the chemical on your second or third sniff, but it is still there. The color of smoke and flame can help identify the presence of a hazardous material. Irritation to the eyes or skin is also a signal that you are being exposed and that you should leave the danger area.

B. RECOGNIZING TERRORIST ACTIVITIES

When responding to hazardous materials incidents we must be aware of the possible causes of the incident. Many times information from dispatchers, facility personnel and nearby residents can help us identify the cause of the incident prior to or just after our arrival. While trying to determine if an incident is terrorist related, we must remember terrorism can take many forms. Intentional releases of hazardous materials can be caused by international organizations, domestic groups, local individuals or just disgruntled employees. An employee upset with management can cause as much harm as a sophisticated international organization. However, there are some clues which can be used to help confirm a terrorist related incident.

- High profile target
- Easy public access
- Location allows for low detection risk
- Little or no warning
- Reason for release unknown
- Accidental release unlikely
- Target related to cause of known terrorist groups
- Suspicious individuals nearby or quickly leaving the area
- Suspicious vehicles nearby or quickly leaving the area
- Released material or method of release not consistent with location
- Secondary explosive/release devices discovered
- Known recent threats to target

Although it is easy to become focused on the immediate needs of a response to a hazardous material incident, the first responder must avoid tunnel vision and be aware of any clues that may indicate possible terrorist activities. We can no longer assume we are only viewed as “good guys”. We must be aware of our surroundings and be able to identify new types of hazards related to intentional releases.

C. NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK

This guidebook is intended to be used in conjunction with placards and labels found on transport vehicles and containers. It provides only general information about various hazardous materials and should only be used until more specific data is obtained from MSDS’ and other resources.

- Developed by U.S. Dept. of Transportation
- Published every three years
- Organized and color coded as follows:
  - Yellow - UN identification number
  - Blue - Name of material (alphabetically)
  - Orange - Emergency guide pages
  - Green - Table of initial isolation and evacuation distances
  - White - Usage directions and guidance

NAERG EXERCISE

	UN #	NAME	GUIDE #/INFORMATION
SUBSTANCE #1			
SUBSTANCE #2			
SUBSTANCE #3			

D. CHEMTREC

CHEMTREC is a 24 hour emergency information service located in the Washington D.C. area, provided by the Chemical Manufacturers Association. This service utilizes a toll free telephone number, allowing the responder to access information about specific chemicals and linking the responder to shippers and manufacturers. When calling however, information should be readily available describing the incident, materials involved, the shipper, and any other pertinent data. The toll free telephone number is:

800-424-9300

E. NATIONAL RESPONSE CENTER

The **National Response Center** is operated by the U.S. Coast Guard and is also a 24 hour resource. The NRC must be notified by the responsible party immediately upon release into the environment of a reportable quantity of a hazardous substance. After receiving notification of a release, the NRC will notify the appropriate Federal On-Scene Coordinator and concerned federal agencies. The toll free telephone number is:

800-424-8802

F. MILITARY SHIPMENTS

When assistance is needed for incidents involving Department of Defense materials, the responder may call one of the following numbers as appropriate.

For emergency incidents involving explosives and ammunition call collect to the **U.S. Army Operations Center**.

703-697-0218

For emergency incidents involving materials other than explosives and ammunition call the **Defense Logistics Agency**.

800-851-8061

G. CAMEO

CAMEO (Computer Aided Management of Emergency Operations) is a computer program that was developed by the US EPA and the National Oceanic and Atmospheric Administration. It is available through the National Safety Council in MacIntosh, DOS, and Windows formats. The CAMEO program includes an extensive chemical database complete with response information on most substances. It also provides pre-designed and formatted database modules that allow the responder to store detailed information about nearby facilities, resources, contacts and more. CAMEO is accompanied by a mapping program to allow use of local area maps and a plume dispersion modeling program called ALOHA. Additional information can be obtained by contacting the National Safety Council at 800-99CAMEO.

H. TERRORIST INCIDENT RESOURCES

• Local Police Department	
• Michigan State Police, EMD District Coordinator	
• Michigan State Police, Criminal Intelligence Section	517-336-6627
• Army Operations Center	703-697-0218/0219
• Defense Logistics Agency	800-851-8061
• Federal Bureau of Investigation, Detroit	810-965-2323
• Federal Bureau of Investigation, Lansing	517-487-1850
• Secret Service, Grand Rapids	616-456-2276

I. OTHER RESOURCES

Numerous other resources are available for the first responder's use. Many computer programs as well as technical manuals are readily obtainable from organizations and suppliers. During emergency operations it is considered good practice to try to confirm information by using at least three different sources of data.

RECOGNITION AND IDENTIFICATION EXERCISE

The instructor will display a series of slides for you to identify whether or not a hazardous material is present in the slide. Circle **YES** if hazardous materials may be present and **NO** if they are not. For each yes answer, circle the number representing the clue(s) used to indicate the presence of hazardous materials.

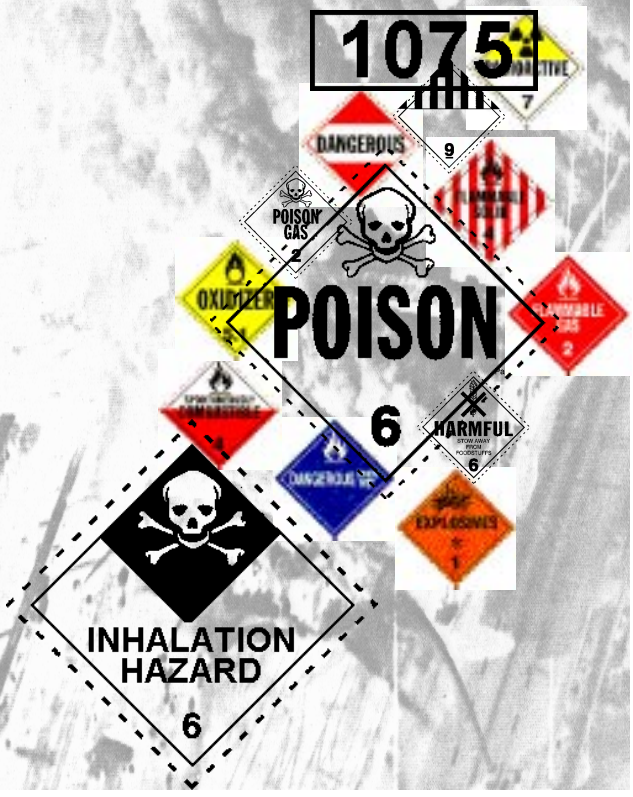
CLUES:

1. **Occupancy/location**
2. **Container shapes/sizes**
3. **Markings/colors**
4. **Placards/labels**
5. **Shipping papers**
6. **Senses**

1.	YES	NO	1	2	3	4	5	6
2.	YES	NO	1	2	3	4	5	6
3.	YES	NO	1	2	3	4	5	6
4.	YES	NO	1	2	3	4	5	6
5.	YES	NO	1	2	3	4	5	6
6.	YES	NO	1	2	3	4	5	6
7.	YES	NO	1	2	3	4	5	6

UNIT FOUR

Response and Incident Management



When responding to a hazardous materials incident we must begin managing the incident the moment we are dispatched. This type of incident is seldom static and can change dramatically by the time we arrive. It is imperative that we quickly plan our routes of response and initial actions to prevent accidental exposures and injuries to responders. If we are not dispatched but find ourselves first on the scene, we must know how to establish scene management and initiate an appropriate response. In either case, we must be aware of the possible existence of clandestine drug manufacturing laboratories as well as an intentional release of hazardous materials (terrorist activities) and know how to recognize related dangers.

A. RESPONSE

■ APPROACH

Due to the potential quick migration of hazardous materials and the dangers associated with them, the responder must approach the incident scene from a direction and in a manner that maximizes his/her safety. By quickly observing environmental conditions we can respond:

- Upwind
- Uphill
- Upstream

Unlike most emergency incidents, we must stop (before we reach the actual scene) at what we estimate to be a safe distance.

> ***NOTE:*** *This stopping point may be different for each incident. It can be determined based upon previous knowledge and experience, dispatch information, reports from persons nearby or on scene, and observation while responding. When responding to known or suspected drug lab fires it is important to maintain a safe distance from the resulting smoke.*

■ IDENTIFY

After stopping, the responder should use binoculars to survey the scene and identify the substances involved using the clues discussed in Unit III. While surveying the scene, the first responder should look for:

- Vapor clouds
- Smoke
- Environmental damage
- Injured persons
- Evidence of explosive devices
- Secondary devices
- Other booby traps
- Surrounding populations
- Dispersion pathways
- Suspicious individuals and circumstances

> ***NOTE:*** *The minimum size of binoculars recommended is 10x50.*

A closer approach to the incident scene may be made only after a positive identification of the substance(s) is made and the conditions surrounding the incident indicate it is safe to do so.

■ Communicate

It is imperative that the first responder communicate information gathered during the approach and the initial scene survey to the dispatcher or other off site agency to ensure appropriate actions are taken. **If the responder fails to do so prior to initiating scene security or management, the information may never be relayed.**

B. SCENE MANAGEMENT

■ Command post

Upon arrival, the first responder should establish a command post (CP) at a safe distance, but within visual range if possible. This location should be safe from toxic vapor clouds or potential explosions. The location of the command post must be relayed to the dispatcher and all subsequent activities should be coordinated through the CP.

■ Incident Command System

The Michigan Occupational Safety and Health Administration (MIOSHA) requires that an Incident Command System (ICS) be utilized during a response to a hazardous materials incident. The individual in charge of the ICS shall be the senior emergency response official responding to the incident. This means that responsibility for commanding the incident can be passed to higher ranking individuals as they arrive on the scene.

A thorough knowledge of the Incident Command System to be used is recommended. A brief description of the National Fire Academy's ICS is provided. This system has been adopted by major federal and state agencies and is recommended by the State of Michigan for use at a hazardous material incident. The components of the NFA's ICS are:

- Common terminology
- Modular organization
- Integrated communications
- Single/unified command
- Consolidated action plans
- Manageable span of control
- Designated incident facilities
- Comprehensive resource management

This ICS can be used for all types and sizes of incidents and allows us to manage an emergency in much the same way we would manage any other task or business. Because of the modular organization, the system can be expanded or reduced in size as needs dictate. A key element of this system is the ability to maintain a manageable yet effective span of control.

> ***NOTE:*** *The optimum span of control is considered to be five, however a range of three to seven is acceptable and still effective.*

■ Reasons for incident command

- Fix responsibility to an individual, provide accountability
- Insure that a strong, direct and visible command is established
- Develop an effective response framework
- Eliminate free-lancing

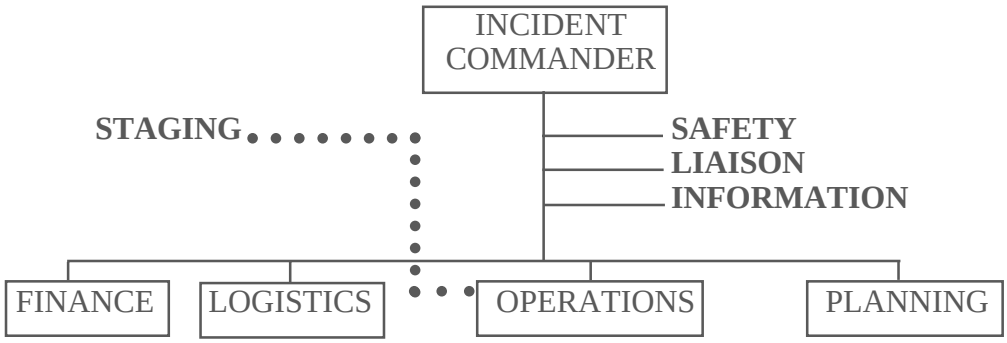
Clear and strong command is needed to maintain consistent procedures and coordinate efforts toward positive incident control. This should eliminate independent deci-

sion making (free-lancing) and tunnel vision. In addition, unity of command is maintained and effective resource use is ensured. Establishing command provides leadership at the incident scene and increased responder safety.

■ IMPLEMENTING THE COMMAND SEQUENCE

1. First arriving person or supervisor establish/assume command
2. Establish a formal command post
   - Incident priorities considered
   - Constant size-up takes place
   - Goals/objectives developed
   - Coordination of tactical operations
3. Develop the organizational structure

BASIC NFA MODEL ICS



■ FUNCTIONS OF COMMAND

- Assume command (Scene Manager)
- Transmit initial on-scene report
- Establish scene security
- Perform size-up (incident assessment)
- Develop strategy plans
- Request additional resources (as needed)
- Establish the necessary level of supervision
- Make assignments
- Acquire progress reports
- Evaluate efforts
- Revise strategy plans as necessary
- Ensure documentation of incident

■ SCENE SECURITY

After communicating initial information, the first responder must try to establish a secure zone around the incident site. This may be difficult in the early stages of an incident, however entry to the area must be restricted to ensure subsequent injuries are not sustained and intentional tampering does not take place. Methods available to use for scene security include:

- Establish road blocks
- Post security
- Mark off incident area (rope, barrier tape, etc.,)
- Establish single entry point
- Establish media location point

NOTE: *Additional resources will likely be required to ensure effective scene security.*

■ PROTECTIVE ACTIONS

Many times, hazardous materials incidents require the first responder to initiate protective actions for the surrounding population. There are three primary protective actions available to us:

- Isolation
- Evacuation
- In-place sheltering

1. ISOLATION

Isolation is the process of keeping everyone away from the area if they are not directly involved in emergency operations. This task is performed first to establish control over the scene prior to other protective actions.

2. EVACUATION

Evacuation is the process of moving all people from a threatened area to a safer place. Enough time must be available to perform evacuation procedures including warning and moving the people involved. A shelter location for those evacuated should be identified prior to implementing the evacuation. Evacuation notifications can be made using one or more of the following methods:

- Door-to-door
- Radio/television
- Telephone
- Emergency vehicle loudspeakers

NOTE: *Authority for mandatory evacuations in Michigan must come from the governor's office. However, proper communication and warning of the potential hazards to affected people usually results in their cooperation.*

3. IN-PLACE SHELTERING

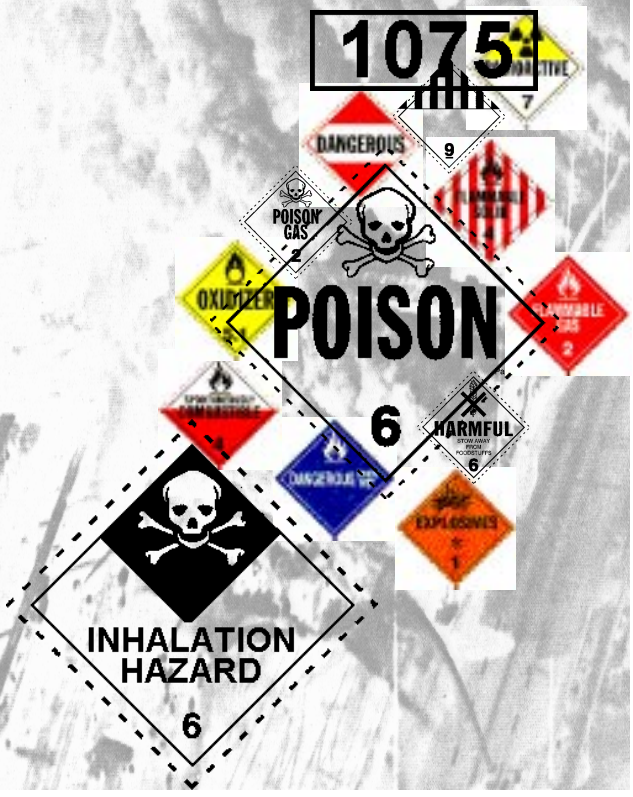
In-place sheltering (protection) requires people inside a building to remain inside until the danger has passed. This method is used when an evacuation cannot be performed, or when evacuation would cause greater risk to people than staying where they are. Procedures for in-place protection include:

- Close all doors and windows
- Turn off all heating, cooling and ventilating systems
- Stay as far away as possible from doors and windows
- Maintain communication with responders if possible

The decision to perform population protective actions must be made considering the substances involved and their associated hazards, the actual or potential duration of the release, resources available to perform the protective action, and the risk posed to emergency responders.

Each incident has different circumstances and should be handled accordingly. Again, the responder must be conscious of the circumstances surrounding the incident and be wary of potential secondary explosive/release devices placed by terrorists or disgruntled employees, while performing population protective actions.

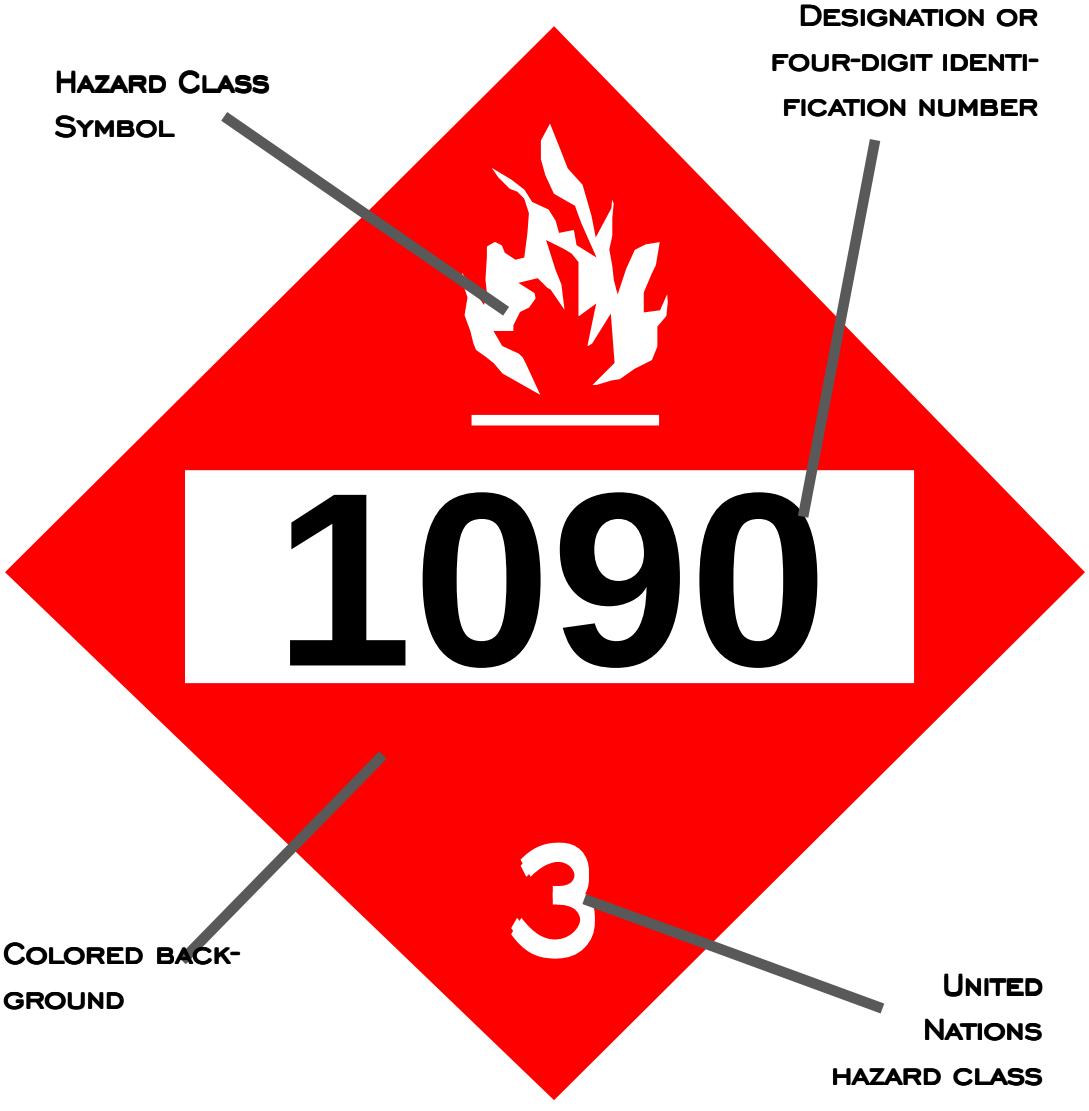
ATTACHMENTS



PLACARD RECOGNITION TABLE

HAZARD CLASS	SYMBOL	BACKGROUND COLOR	CLASS/ DIVISION
EXPLOSIVES	EXPLODING BOMB	ORANGE	
MASS EXPLOSION HAZARD			1.1
PROJECTION HAZARD			1.2
FIRE HAZARD			1.3
NO SIGNIFICANT BLAST HAZARD			1.4
BLASTING AGENTS, VERY INSENSITIVE			1.5
EXTREMELY INSENSITIVE DETONATING ARTICLES			1.6
GASES			
FLAMMABLE	FLAME	RED	2.1
NON-FLAMMABLE	GAS CYLINDER	GREEN	2.2
TOXIC BY INHALATION	SKULL & CROSSBONES	WHITE	2.3
CORROSIVE (CANADA)	GAS CYLINDER	WHITE	2.4
FLAMMABLE/COMBUSTIBLE LIQUIDS	FLAME	RED	3
FLAMMABLE SOLIDS	FLAME	RED/WHITE STRIPES	4.1
SPONTANEOUSLY COMBUSTIBLE	FLAME	WHITE OVER RED	4.2
DANGEROUS WHEN WET	FLAME	BLUE	4.3
OXIDIZERS	FLAME OVER CIRCLE	YELLOW	5.1
ORGANIC PEROXIDES	FLAME OVER CIRCLE	YELLOW	5.2
TOXIC	SKULL & CROSSBONES	WHITE	6.1
TOXIC (KEEP AWAY FROM FOOD)	ST. ANDREW'S CROSS/WHEAT	WHITE	6.1
INFECTIOUS SUBSTANCE	THREE CRESCENTS ON CIRCLE	WHITE	6.2
RADIOACTIVE MATERIALS	TREFOIL	YELLOW OVER WHITE	7
CORROSIVE MATERIALS	TEST TUBES/HAND/METAL	WHITE OVER BLACK	8
MISCELLANEOUS DANGEROUS GOODS (CANADA)		VERTICAL STRIPES OVER WHITE	9

General Hazard Recognition



NFPA 704 M HAZARD IDENTIFICATION SYSTEM

This information is excerpted from the National Fire Protection Association's Fire ***Protection Guide on Hazardous Materials, 9th Edition****. The full publication is available from the NFPA at Batterymarch park, Quincy, MA 02269. This is the recommended system for the identification of the fire hazards of hazardous materials. The NFPA manual also contains additional HAZMAT response information useful to the first responder and would make an excellent addition to any HAZMAT library.*

NFPA 704 M is a standardized system which uses numbers and colors on a sign to define the basic hazards of a specific material. Health, flammability and reactivity are identified and rated on a scale of 0 — 4, depending on the degree of hazard presented *(see figure 1)*.

The ratings for individual chemicals can be found in the ***NFPA Guide to Hazardous Materials***. Other references, such as the ***US Coast Guard Manual***, ***CHRIS Volume 2*** and the ***National Safety Council's Fundamentals of Industrial Hygiene***, contain the NFPA ratings for specific chemicals.

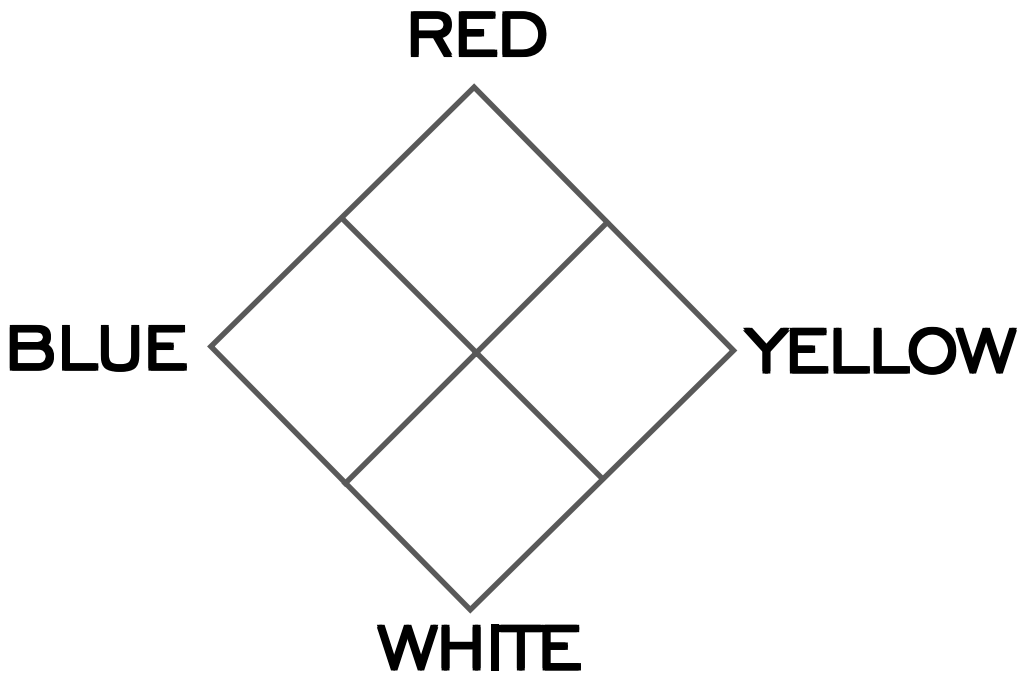


Figure 1 — Example of NFPA 704 M Hazard Identification System

SUMMARY OF HAZARD RANKING SYSTEM

HEALTH HAZARD (BLUE)

RANK NUMBER	DESCRIPTION	EXAMPLES
4	Materials that on very short exposure could cause death or major residual injury, even though prompt medical treatment was given.	Acrylonitrile Bromine Parathion
3	Materials that on short exposure could cause serious temporary or residual injury, even though prompt medical treatment was given.	Aniline Sodium hydroxide Sulfuric acid
2	Materials that on intense or continued exposure could cause temporary incapacitation or possible residual injury, unless prompt medical treatment was given.	Bromobenzene Pyridine Styrene
1	Materials that on exposure would cause irritation but only minor residual injury, even if no medical treatment was given.	Acetone Methanol
0	Materials that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible material.	

FLAMMABILITY HAZARD (RED)

RANK NUMBER	DESCRIPTION	EXAMPLES
4	Materials that (1) rapidly or completely vaporize at atmospheric pressure and normal ambient temperatures, and burn readily, or (2) are readily dispersed in air and burn readily.	1,3-Butadiene Propane Ethylene oxide
3	Liquids and solids that can be ignited under almost all ambient temperature conditions.	Phosphorous Acrylonitrile
2	Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.	2-Butanone Kerosene
1	Materials that must be preheated before ignition can occur.	Sodium Red Phosphorous
0	Materials that will not burn.	

REACTIVITY HAZARD (YELLOW)

RANK NUMBER	DESCRIPTION	EXAMPLES
4	Materials that, in themselves, are readily capable of detonation or of explosive decomposition, or reaction at normal temperatures and pressures.	Benzoyl peroxide Picric acid TNT

REACTIVITY HAZARD (YELLOW — CONTINUED)

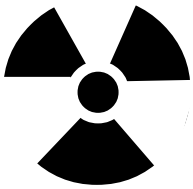
RANK NUMBER	DESCRIPTION	EXAMPLES
3	Materials that (1) in themselves, are capable of detonation or explosive reaction but require a stron initiating force, (2) must be heated under confinement before initiation, or (3) react explosively with water.	Diborane Ethylene oxide
2	Materials that (1) in themselves, are normally unstable and readily undergo violent chemical change, but do not detonate, (2) may react violently with water, or (3) may form potentially explosive mixtures with water.	Acetaldehyde Potassium
1	Materials that in themselves are normally stable but which can (1) become unstable at elevated temperatures, or (2) react with water with some release of energy (but not violently).	Ethyl ether Sulfuric acid
0	Materials that in themselves are normally stable, even when exposed to fire, and that do not react with water.	

SPECIAL INFORMATION (WHITE)

The white block is designated for special information about the chemical. For example, it may indicate that the material is radioactive by displaying the standard radioactive symbol, or unusually water-reactive by displaying a large W with a slash through it.

Water Reactive

Radioactive



Oxidizer OXY

Radioactive COR

Acid ACID

Radioactive ALK

HMIS® LABELS

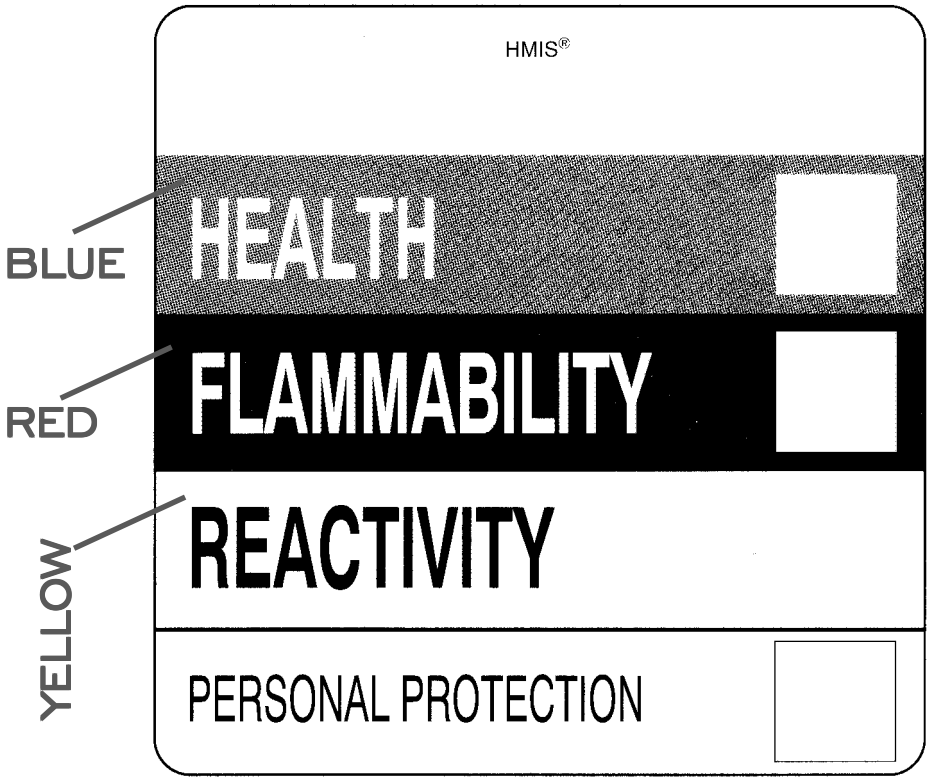
The HMIS® Labels and signs provide information on:

1. *Chemical Identity* — May be the chemical common name.

2. *Degree of acute health, flammability, and reactive hazards* — Labels contain three colored horizontal bars (blue for health, red for flammability, and yellow for reactivity), each with a separate numerical coding. The degree of hazard is expressed on a scale of 0 to 4, with 0 denoting a minimum hazard, and 4, a severe hazard.

3. *Proper personal protective equipment* — A white bar at the bottom of the label contains a letter which represents one or more personal protective devices that must be used when handling that substance.

4. *Chronic health hazards* — This includes special precautions or handling procedures that should be followed when working with the substance. The presence of chronic effects may be indicated by an asterisk (*) or other designation after the health hazard rating which corresponds to other available information; or by the use of written warnings in the upper white section of the label.



Identification of Shipping Papers

Modes of Transportation	Title of Shipping Paper	Location of Shipping Paper	Responsible Person(s)
HIGHWAY	BILL OF LADING	CAB OF VEHICLE	DRIVER
RAIL	WAYBILL/CONSIST	WITH CREW	CREW
WATER	DANGEROUS CARGO MANIFEST	WHEELHOUSE OR PIPE-LIKE CONTAINER ON BARGE	CAPTAIN OR MASTER
AIR	AIR BILL WITH SHIPPER'S CERTIFICATION FOR RESTRICTED ARTICLES	COCKPIT	PILOT

Non-Negotiable Bill of Lading

FORM 50604 REV. 10/86

ORIGINAL

ALL ITEMS SUBJECT TO CONDITIONS ON REVERSE SIDE HEREOF

CARRIER'S AGENT (DRIVER)

JOHN DOE

LOADER SIGNATURE

BILL BEAN

SHIPMENT RECEIVED BY:

OPTIONAL

TRUCK SEAL NUMBERS

CERTIFIED LOAD, etc.

Carrier certifies that cargo tank supplied for this shipment is a lawful container for the transportation of this commodity.

If this shipment moves, in other than shipper's vehicle, the terms will be those (a) of the contract between shipper and carrier or (b) the term of the lawfully applicable tariffs if the carrier is a common carrier.

MATERIAL SAFETY DATA SHEET AVAILABLE FOR THESE PRODUCTS UPON REQUEST

DATE
NUMBER 01/16/89
TIME IN 345949-016
TIME OUT 1138
1147

SOLD TO (CONSIGNEE)	SHIPPED FROM	LOCATION CODE
	Detroit Michigan	
EMRO MKTG CO - CENTRAL DIV 1334	DATE SHIPPED 01/16/89	SHIPPED VIA 318100
P O BOX 1500	STA 002268 CONSOLIDATED WEST 7 MILE & LAHSER	
SPRINGFIELD OH 455010000		

SHIPPER XXXXX

DESTINATION MARATHON PETROLEUM CO CUSTOMER NUMBER 263625946401000 FREIGHT BILL NUMBER DOA 31555

ORIGIN NUMBER	MI	TRAILER NUMBER	PUP NUMBER	CUSTOMER P O AND RELEASE NUMBER	TRANSMITTED CUSTOMER P AND RELEASE NUMBER

PRODUCT DESCRIPTION AND MATERIAL LABEL	GROSS GAL. 0300	NET GAL. 0288 0628	TEMP / API GR. 0000	BILLED QTY.	UNIT PRICE	EXTENDED AMOUNT
GASOLINE FLAMMABLE LIQUID UN 1203 103 UNLEADED REGULAR GASOLINE	3492	3524	47.0 63.7			
GASOLINE FLAMMABLE LIQUID UN 1203 104 SUPER UNLEADED GASOLINE	3002	3056	34.0 61.4			
GASOLINE FLAMMABLE LIQUID UN 1203 103 UNLEADED REGULAR GASOLINE	2500	2523	47.0 63.7			

TAX LICENSE AND STATE

TOTAL

SAFETY IS NO ACCIDENT!!

UNIFORM HOUSEHOLD GOODS BILL OF LADING AND FREIGHT BILL

VEHICLE NO.

SAMPLE ONLY

J.A.R. FREIGHT FORWARDING CO., INC.
13841 REDSKIN DRIVE
HERNDON, VIRGINIA 22071
(703) 471-5704

I.C.C. NO. FREIGHT #FF916

IN CASE OF NEED CONTACT TRAFFIC CONTROL MGR AT ABOVE ADDRESS OR TELEPHONE NUMBER

CONNECTING OR INTERLINING CARRIER (IF ANY) _____ ADDRESS _____ PHONE _____

RECEIVED, subject to classifications, tariffs, rules and regulations including all terms printed or stamped hereon or on the reverse side hereof in effect on the date of issue of this bill of lading

SHIPPER _____ DATE _____
ADDRESS _____
FLOOR _____ ELEV. _____ TEL. _____
CITY _____ COUNTY _____ STATE _____

CONSIGNED TO _____
ADDRESS _____
FLOOR _____ ELEV. _____ TEL. _____
CITY _____ COUNTY _____ STATE _____

ACTUAL PICKUP DATE	AGREED PICKUP DATE or period of time (If applicable)	GUARANTEED PICKUP DATE (If applicable)	AGREED DELIVERY DATE (If applicable)	GUARANTEED DELIVERY DATE (If applicable)
			Daily Allowance	

NOTIFICATION OF CHARGES

SHIPPER REQUESTS NOTIFICATION OF ACTUAL CHARGES TO PARTY SHOWN BELOW ☐ (C.O.D. SHIPPERS ONLY)

NOTIFY _____
ADDRESS _____ TEL. _____

IN CASE OF DELAY, OR IF CHARGES EXCEED ESTIMATE BY MORE THAN 10%
NOTIFY _____
ADDRESS _____ TEL. _____

Payment in Cash or Certified Check, Money Order, Traveler's Check or Cashier's Check

BILLING INFORMATION

NAME _____
ADDRESS SAMPLE ONLY
CITY & STATE _____
ATTENTION OF _____

INSURANCE. The shipper declares the actual cash value of the shipment to be $ _____.
Insurance Rate $ _____ per hundred dollars, premium $ _____
Signature _____

SPECIAL SERVICES

☐ EXPEDITED SERVICE ORDERED BY SHIPPER DELIVERED ON OR BEFORE _____
☐ SHIPMENT COMPLETELY OCCUPIED A _____ CU. FT. VEHICLE
☐ EXCLUSIVE USE OF A _____ CU. FT. VEHICLE ORDERED
☐ SPACE RESERVATION CU. FT. ORDERED
☐ AIR CONDITIONER ☐ WASHER
☐ _____ ☐ _____

Tariff _____
Section _____

	ORIGINAL	REWEIGH
Gross		
Tare		
Net		
Min. Wt.		

SERVICES	RATE	CHARGES
Total Containers Packing & Unpacking		
Transportation Miles		
Add Transp. Charge – Orig. – Dest.		
Cartage: To Whse From Whse Mi		
Storage-in-Transit From To		
Warehouse Handling		
Extra Pickups or Deliveries: No. By		
Extra Labor Men Man Hrs.		
Flight Charge No.		
Excessive Distance Carry: Feet		
Valuation		
Piano Handling		
Appliance Servicing		
Elevator Stairs		
Weight Additive		
Other Charges		
Advanced Charges		

AGENT AND SERVICE DATA	Agt. Code No.		CONTAINERS CU. FT.	CONTAINERS QTY.	CONTAINERS RATE	CONTAINERS EXT.	PACKING SCHEDULE CU. FT.	PACKING SCHEDULE QTY.	PACKING SCHEDULE BY AGY.	PACKING SCHEDULE RATE	PACKING SCHEDULE EXT.	UNPACKING SCHEDULE CU. FT.	UNPACKING SCHEDULE QTY.	UNPACKING SCHEDULE BY AGY.	UNPACKING SCHEDULE RATE	UNPACKING SCHEDULE EXT.
DATE LOADED AT RES.		DRUM DISH PACK, BARREL (OR NOT LESS THAN 5 CU. FT.)	5				5					5				
BY		CARTONS LESS THAN	3				3					3				
DATE LOADED AT WHSE.		CARTONS	3				3					3				
BY		CARTONS	4½				4½					4½				
BOOKED BY		CARTONS	6				6					6				
ORIGIN AGENT		CARTONS	6½				6½					6½				
PACKED BY		WARDROBE, CTN.	10				10					10				
HAULER 1.		CRIB MATTRESS CARTON														
FROM TO		MATTRESS CTN., TWIN SIZE (NOT EXCEEDING 39" x 75")														
HAULER 2.		MATTRESS CTN., REG. SIZE (NOT EXCEEDING 54" x 75")														
FROM TO		MATTRESS CTN., KING/QU. (EXCEEDING 54" x 75")														
UNPACKING BY		MATTRESS CTN., (39" x 30")														
DATE DELIVERED		MATTRESS COVER														
DRIVER		CORRUGATED MIRROR CARTONS														
		CRATES														
		CRATES UNDER MINIMUM RATE APPLIES														
		TOTAL CONTAINERS					TOTAL PACKING					TOT. UNPACKING				

TOTAL CONTAINERS PACKING AND UNPACKING

UNLESS THE SHIPPER EXPRESSLY RELEASES THE SHIPMENT TO A VALUE OF 60 CENTS PER POUND PER ARTICLE, THE CARRIER'S MAXIMUM LIABILITY FOR LOSS AND DAMAGE SHALL BE EITHER THE LUMP SUM VALUE DECLARED BY THE SHIPPER OR AN AMOUNT EQUAL TO $1.25 FOR EACH POUND OF WEIGHT IN THE SHIPMENT, WHICHEVER IS GREATER.

THE SHIPMENT WILL MOVE SUBJECT TO THE RULES AND CONDITIONS OF THE CARRIER'S TARIFF. SHIPPER HEREBY RELEASES THE ENTIRE SHIPMENT TO A VALUE NOT EXCEEDING $ _____
(TO BE COMPLETED BY PERSON SIGNING BELOW).

NOTICE: THE SHIPPER SIGNING THIS CONTRACT MUST INSERT IN THE SPACE ABOVE IN HIS OWN HANDWRITING, EITHER HIS DECLARATION OF THE VALUE OF THE ENTIRE SHIPMENT OR HIS RELEASE OF THE SHIPMENT TO A VALUE NOT EXCEEDING 60 CENTS PER POUND PER ARTICLE.

Minimum Weight or Volume Charge
Terms & Conditions for Payment of Total Charges Charges☐ Prepaid☐ C.O.D.☐
Maximum amount to be paid at time of delivery to obtain delivery of an estimated C.O.D. shipment
BALANCE DUE (30 Working Days, Credit Extended if Requested)
Prepayment Collected by
BALANCE DUE

DELIVERY ACKNOWLEDGEMENT: THE ABOVE-DESCRIBED ARTICLES WERE RECEIVED IN GOOD CONDITION EXCEPT AS NOTED.

FIRST RESPONDER AWARENESS TRAINING FOR HAZARDOUS MATERIALS

```
                                TRAIN LIST NO. 1

                        CARS IN THIS CONSIST COUNT FROM FRONT TO REAR

TRAIN/JOB      CONDUCTOR
 FPAD   25      WILLIAMS
NAME--                        CATEGORY--T--SECONDARY MANIFEST   TYPE--THRU

ENGINE-IDENT     HORSEPOWER      LENGTH     WEIGHT     STATUS
UP         57      3500           59          134
UP       1989      2000           59          131
TOTAL              5500 HP        118 FEET    265 TON

TRAIN/JOB--  FPAD  25 WITH FOLLOWING CARS TA   AMELIA   TX  TIME-- 05/25 1250

 SEQ EQUIPMENT ID  KND GWT COMDTY  DESTN  ZTS/CARR NXBLK CITY/STATE  CONSIGNEE

FTU/ETU IDENT     TYPE         STATUS
UPF    86140      FTU            WK
UPR     7301      ETU            WK

BLOCK--  AMEL    B 450

   1 ACFX 99336 L CAL 129 POLCHL  62C 817 SOU        SOUB PINEVILLENC ESLON THER
                  R60 SPEED RESTRICTED CAR
                  CAR TRIP LEASED TO CONSIGNEE

   2 ELTX  1632 L CAL 128 PLSTIC  62B 649 ICG             ABBEVILLETN PLEXCO
                  R60 SPEED RESTRICTED CAR
                  CAR TRIP LEASED TO CONSIGNEE

   3 ROIX 57153 L CAL 126 POLCHL  62C 817 SOU        SOUB FTMILL   SC QUEEN CIT
                  R60 SPEED RESTRICTED CAR
                  CAR TRIP LEASED TO CONSIGNEE

   4 PTLX 41011 L CAL 125 POLCHL  62C 817 SOU        SOUB PINEVILLENC ESLON THER
                  R60 SPEED RESTRICTED CAR
                  CAR TRIP LEASED TO CONSIGNEE

   5 GACX 50795 L CAL 121 POLYET  62C 817 SOU        SOUB ZEBULON  NC ILLINO TOO
                  R60 SPEED RESTRICTED CAR
                  CAR TRIP LEASED TO CONSIGNEE

   6 GATX 50560 E T25  42         63TB085 04-876-00 ADIS PLAQUEMINLA DOW CHE US
                  R60 SPEED RESTRICTED CAR
     ************************           RESIDUE:LAST CONTAINED
     *       DANGEROUS      *           VINYL CHLORIDE
     ************************           FLAMMABLE GAS
     EMERGENCY CONTACT: 800-424-9300    UN1086
                                        RQ(VINYL CHLORIDE)
                                        PLACARDED:
                                        FLAMMABLE GAS-RESIDUE
                                        HAZMAT STCC: 4905792

   7 DOWX  5550 L CAL 121 POLYET  68BE490 01-936-00 ORNG ORANGE   TX JAMES RIVR
                  R60 SPEED RESTRICTED CAR
                  CAR TRIP LEASED TO CONSIGNEE

   8 DUPX  8377 L T25  75 POIS A. 62B 649 ICG             WOODSTOCKTN DUPONT
                  R60 SPEED RESTRICTED CAR   SHOVE TO REST AND COVER
     ************************           1 T/C
     *       POISON GAS     *           HYDROCYANIC ACID
     ************************           POISON A
```

802 – UNION PACIFIC RAILROAD COMPANY – 802
FREIGHT AND TRANSIT WAYBILL

FORM 715 REV. 71

3

DANGEROUS

D FOR SINGLE CONSIGNMENTS CARLOAD, LESS CARLOAD AND TOFC

INITIAL & NUMBER	KIND	GROSS	TARE	NET	LENGTH / CAPACITY OF CAR	PREPAID FREIGHT BILL IN DOLLARS	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

SHIPPING OR AGENTS ROUTING "F" OR "J" | S

RECONSIGNED TO: AUTHORITY STATION NO. | STATION | STATE | RWC

CONSIGNEE AND COMPLETE ADDRESS | CODE

CALGAS LANE COUNTY, INC
SPRINGFIELD, OREGON 97101

FINAL DESTN. - ADDITIONAL ROUTING

SPRINGFIELD, OREGON

FROM | NUMBER | STATION | STATE

ORIGIN 000090 Los Angeles California

BILLED AT

SHIPPER AND COMPLETE ADDRESS | CODE

CANMORE MINES LTD.
5000 Ferguson Drive
LOS ANGELES, CALIFORNIA 90022

BILL OF LADING OR INVOICE NUMBER | ORDER NUMBER

SHOW TO WHOM FREIGHT BILL SHOULD BE BILLED NAME, ADDRESS, CITY, STATE, AND ZIP CODE

AGREEMENT WEIGHTS

WEIGHED AT | AGREEMENT NUMBER

GROSS	TARE	ALLOWANCE	NET

SHOW AMOUNT IN THE WHITE STATE ESTIMATE THE AS PER CLAUSE OF METHOD I OF THE BILL OF LADING ISSUED THIS

PREPAID — IF CHARGES ARE PREPAID, INSERT "PREPAID"

LEASED CAR — INCENTIVE OR LEASED CAR OR UNIT TRAIN NUMBER

"If the shipment moves between ports served 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

INSTRUCTIONS: REGARDING PROTECTIVE SERVICE, BILLING, 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

COMMODITY 49-057-81

NO. PKGS.	DESCRIPTION OF ARTICLES	* WEIGHT	RATE	FREIGHT	ADVANCES	PREPAID
1 T/C	LIQUIFIED PETROLEUM GAS FLAMMABLE GAS UN 1075 PLACARDED: FLAMMABLE GAS	126,494 LBS	Weights and charges to follow. PREPAID.			

DANGEROUS CARGO MANIFEST PAGE 1of 3

VESSEL CANAVERAL OFF. NO. 220000

VOYAGE 038S DATE 9/9/89

MASTER CAPT. COFF PORT DEPARTURE BALTIMORE,M.

FLAG U.S. FINAL PLAN SAN JUAN,P.R.

NO.	COMMODITY (TRUE SHIPPING NAME)	CLASSIFICATION	LABEL	CONTAINER NO.	STOWAGE	QTY.	TYPE	WT.
1	SODIUM PERSULPHATE(WATER TREATMENT COMPOUND)							
2		OXIDIZER	UN1505	SEKU 104214	090304	10	PAIL	620
3	CALCIUM HYPOCHLORITE MIXTURE DRY							
4		OXIDIZER	UN1749	SEKU 132516	090104	20	PAILS	2140
5	HYDROCHLORIC ACID	CORROSIVE MATERIAL	UN1789	SEKU 132818	030207	3	CANS	72
6	ACETIC ACID GLACIAL	CORROSIVE MATERIAL	UN2789	SEKU 132818		8	CANS	308
7	FLAMMABLE LIQUID NOS	FLAMMABLE LIQUID	UN1993	PRMU 220218		1	SKID	1200
8	XYLENE(XYLOL)	FLAMMABLE LIQUID	UN1307	PRMU 220218		1	DRM	398
9	ETHYL ALCOHOL	FLAMMABLE LIQUID	UN1170	PRMU 220218	030907	48	PAIL	1920
10	METHYL ETHYL KETONE	FLAMMABLE LIQUID	UN1193	PRMU 220218		1	PAIL	50
11	ETHYL ALCOHOL	FLAMMABLE LIQUID	UN1170	PRMU 220218		15	PAIL	600
12	BATTERIES WET FILLED WITH ACID							
13		CORROSIVE MATERIAL	UN2794	PRMU 220413	100305	713	PKG.	24652
14	CORROSIVE SOLID NOS	CORROSIVE MATERIAL	UN1759	TILU 450088		1	DRM	505
15	CORROSIVE LIQUID NOS(CLEANING LIQUID)				020407			
16		CORROSIVE MATERIAL	UN1760	ITLU 450088		4	DRMS	2260
17	ETHANOL	FLAMABLE LIQUID	UN1170	LYXU 450103	020208	5	DRMS	2508
18	CEMENT LIQUID	FLAMMABLE LIQUID	UN1133	LYXU 450145		8	BXS	300
19	INK	FLAMMABLE LIQUID	UN1210	LYXU 450145	020108	1	CTN	16
20	INK	FLAMMABLE LIQUID	UN1210	LYXU 450145		1	CTN.	8
21	CAUSTIC ALKALI LIQUID NOS(DIETHYLENE TRIAMINE 20%)							
22		CORROSIVE LIQUID	NA1719	LYXU 450573		150	CTNS	1170
23	CAUSTIC ALKALI LIQUID NOS(N-AMINOETHYLPIPERAZINE 20%)				020807			
24		CORROSIVE MATERIAL	NA1719	LYXU 450573		15	CANS	375
25	INK	FLAMMABLE LIQUID	UN1263	SCXU 450724	080202	3	PAILS	165
26	ADHESIVE	FLAMMABLE LIQUID	UN1133	PRMU 835438	030707	2	BRMS	874
27								
28								
29								
30								

I, B.C.GOFF, acknowledge the correction of this manifest to the best of my knowledge and belief.

MASTER OR LICENSED DECK OFFICER

I, CHESTER P. STILLING;ASST. CLERK, the undersigned certify that, the above information based on information furnished by the shipper, is true and correcyto the best of my knowledge and belief.

SUPERVISOR OF PERSON PREPARING MANIFEST

MIL-RITE PRINTING

PRESS HARD – YOU ARE WRITING THROUGH 7 COPIES

BLUE RIBBON AIR CARGO, INC.
G.P.O. BOX 605
STATEN ISLAND, NY 10314

FOR ASSISTANCE ANYTIME
DAY OR NIGHT CALL (212) 730-2424
NEW YORK: (718) 322-1020
CHICAGO: (312) 228-1133
NATIONWIDE: 1-800-368-6686
FAX (718) 322-7288

AIR BILL NO
30009872

ORIGIN

TARIFF DESTINATION

DATE | CHARGES: PREPAID / COLLECT / THIRD PARTY | DECLARED VALUE | INSURANCE | DELIVERY INSTRUCTIONS

$ | $ | CHECK ONE | DELIVER | HOLD FOR PICKUP

TOTAL BILL WT

SHIPPER'S NAME

CONSIGNEE NAME

SHIPPER'S C.O.D.

FROM ADDRESS

TO ADDRESS

CITY STATE ZIP CODE

CITY STATE ZIP CODE

FREIGHT CHARGES

SHIPPER'S REFERENCE NUMBER

SHIPPER'S SIGNATURE

X

PHONE NUMBER IF HOLD FOR PICKUP

EXCESS VALUE

NO. PIECES | WEIGHT | DESCRIPTION OF PIECES CONTENTS MARKS NUMBERS ETC

INSURANCE

3RD PARTY BILL NO.

BILL TO

NAME

EXTENDED AREA

ADDRESS

ORIGIN ADVANCES

CITY STATE ZIP CODE

C.O.D. FEE

SPECIAL INSTRUCTIONS

CHECK BOXES FOR SERVICES REQUIRED

REDELIVERY CHGS

SAME DAY SERVICE

PRIORITY SERVICE (Overnight)

OTHER

STANDARD SERVICE (2nd Day)

DEFERRED AIR

OTHER

SATURDAY PICKUP (Extra Charge)

SATURDAY DELIVERY (Extra Charge)

OTHER

OTHER SPEC SVC ( )

TOTAL CHARGES

OTHER SPEC SVC ( )

OTHER SPEC SVC ( )

OTHER SPEC SVC ( )

DIMENSIONAL WT

PCS	L	W	H	TOTAL

CUBIC INCHES

CUBIC WEIGHT

$

RECEIVED BY BLUE RIBBON A.C.

SHIPPER'S DOOR

AIRPORT TERMINAL

DECLARED VALUE IS AGREED AND UNDERSTOOD TO BE NOT MORE THAN THE VALUE STATED IN THE GOVERNING TARIFFS FOR EACH POUND ON WHICH CHARGES ARE ASSESSED UNLESS A HIGHER VALUE IS DECLARED HEREIN AND APPLICABLE CHARGES PAID THEREON

ALL CHARGES PAYABLE IN UNITED STATES CURRENCY

IT IS MUTUALLY AGREED THAT THE SHIPMENT DESCRIBED HEREIN IS ACCEPTED ON THE DATE HEREOF IN APPARENT GOOD ORDER EXCEPT AS NOTED FOR CARRIAGE AS SPECIFIED HEREIN SUBJECT TO GOVERNING TARIFFS IN EFFECT AS OF THE DATE HEREOF SAID TARIFFS ARE AVAILABLE FOR INSPECTION BY PARTIES HERETO AND ARE HEREBY INCORPORATED INTO AND MADE PART OF THIS CONTRACT

SIGNED FOR BLUE RIBBON BY

DATE

TIME

X /8

TARIFF REGULATIONS REQUIRE PAYMENT IN 15 DAYS

NON-NEGOTIABLE AIR BILL

SHIPPER'S COPY

DELIVERY RECEIPT FORWARD TO DESTINATION

FIRST RESPONDER AWARENESS TRAINING FOR HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEETS

ATTACHMENT F

MATERIAL SAFETY DATA SHEET PAGE 1 OF 4

PRODUCT NAME: GASOLINE, REGULAR UNLEADED.
MARATHON MSDS NO: 115MAR003

THE FOLLOWING INFORMATION IS FURNISHED SUBJECT TO THE DISCLAIMER ON THE BOTTOM OF THIS FORM

SECTION 1 - PRODUCT IDENTIFICATION

PRODUCT NAME: GASOLINE, REGULAR UNLEADED.

SYNONYMS:
GASOLINE, REGULAR UNLEADED.; REGULAR UNLEADED GASOLINE.

MANUFACTURER / DISTRIBUTOR:
MARATHON PETROLEUM COMPANY
539 SOUTH MAIN STREET
FINDLAY, OHIO
45840

EMERGENCY PHONE NUMBERS:
(419) 422-2121 (MARATHON)
(800) 424-9300 (CHEMTREC)

CHEMICAL FAMILY: PETROLEUM HYDROCARBON
CHEMICAL FORMULA:
CAS NO: MIXTURE

SECTION 2 - PHYSICAL PROPERTIES

BOILING POINT	MELTING POINT	SPECIFIC GRAVITY(H2O=1)
90-437 F	N.A. F	0.71-0.77
% SOLUBILITY IN WATER	VAPOR DENSITY(AIR=1)	VAPOR PRESSURE
NEGLIGIBLE	3-4	414-776 MM HG @ 100F

PH INFORMATION: PH: N.A. AT CONC.
APPEARANCE: BLUE OR CLEAR LIQUID ODOR: GASOLINE

SECTION 3 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT	AUTOIGNITION TEMP	EXPLOSIVE LIMITS (% BY VOLUME IN AIR)
-50 F	C.A. 495 F	LOWER/UPPER: 1.4/ 7.6

EXTINGUISHING MEDIA:

ONLY U.L. APPROVED CLASS B FIRE EXTINGUISHING MEDIA SUCH AS FOAM, CO2, HALON 1211, OR DRY CHEMICAL. WATER SPRAY SHOULD BE USED ONLY BY QUALIFIED FIRE FIGHTING PERSONNEL.

SPECIAL FIRE FIGHTING INSTRUCTIONS:

CAUTION MUST BE FOLLOWED AFTER EXTINGUISHMENT DUE TO EASE OF RE-IGNITION OF HOT GASOLINE VAPORS. WATER CAN BE USED TO COOL EXPOSED SURFACES.

STABILITY: THE MATERIAL IS STABLE AT 70 F, 760MM PRESSURE
CONDITIONS TO AVOID:

HAZARDOUS DECOMPOSITION PRODUCTS:
CARBON MONOXIDE, ALDEHYDES, AROMATIC HYDROCARBONS

INCOMPATIBLE MATERIALS:
OXIDIZERS

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

PRODUCT NAME: GASOLINE, REGULAR UNLEADED.
MARATHON MSDS NO: 115MAR003

SECTION 4 - PRODUCT COMPOSITION AND EXPOSURE LIMITS

EXPOSURE LIMITS FOR PRODUCT:	TLV			SOURCE
GASOLINE, REGULAR UNLEADED.	300.00	PPM	(8 HR TWA)	ACGIH
	500.00	PPM	(STEL)	ACGIH

COMPONENTS:	PERCENT RANGE	TLV			SOURCE
SATURATED HYDROCARBONS (PARAFFINS & CYCLOPARAFFINS)	57.00- 59.00	0.00		( )	
UNSATURATED HYDROCARBONS (OLEFINS)	1.00- 7.00	0.00		( )	
BENZENE	.50- 3.00	10.00	PPM	(8 HR TWA)	ACGIH
		25.00	PPM	(STEL)	ACGIH
		10.00	PPM	(8 HR TWA)	OSHA
		25.00	PPM	(CEILING)	OSHA
		50.00	PPM	(PEAK)	OSHA
AROMATIC HYDROCARBONS (INCLUDING BENZENE, TOLUENE, XYLENES, ETHYLBENZENE & TRIMETHYL BENZENES)	30.00- 40.00	0.00		( )	

COMPLEX MIXTURE OF PARAFFINIC, CYCLOPARAFFINIC, OLEFINIC & AROMATIC HYDROCARBONS (PREDOMINANTLY C4-C12)
***
CONTAINS SMALL AMOUNTS (<0.02%) OF DYES AND OTHER ADDITIVES WHICH ARE NOT CONSIDERED TO BE HAZARDOUS AT THE CONCENTRATIONS USED.

SECTION 5 - POTENTIAL HEALTH EFFECTS

EYE:

EYE IRRITATION MAY RESULT FROM CONTACT WITH THE LIQUID OR EXPOSURE TO VAPOR CONCENTRATIONS ABOVE THE TLV.

SKIN:

PROLONGED OR REPEATED LIQUID CONTACT CAN DEFAT THE SKIN AND LEAD TO IRRITATION AND/OR DERMATITIS.

INHALATION:

EXPOSURE TO VAPOR CONCENTRATIONS EXCEEDING 1000 PPM CAN CAUSE RESPIRATORY IRRITATION, HEADACHE, DIZZINESS, NAUSEA AND LOSS OF COORDINATION. HIGHER CONCENTRATIONS MAY CAUSE LOSS OF CONSCIOUSNESS, CARDIAC SENSITIZATION, COMA AND DEATH RESULTING FROM RESPIRATORY FAILURE.

INGESTION:

INGESTION MAY RESULT IN NAUSEA, VOMITING, DIARRHEA AND RESTLESSNESS. ASPIRATION (BREATHING) OF VOMITUS INTO THE LUNGS MUST BE AVOIDED AS EVEN SMALL QUANTITIES IN THE LUNGS CAN PRODUCE CHEMICAL PNEUMONITIS AND PULMONARY EDEMA/HEMORRHAGE.

PRODUCT NAME: GASOLINE, REGULAR UNLEADED.
MARATHON MSDS NO: 115MAR003

SECTION 5 - POTENTIAL HEALTH EFFECTS (CON'T)

ADDITIONAL TOXICITY INFORMATION:

TWO YEAR INHALATION TOXICITY STUDIES WITH FULLY VAPORIZED GASOLINE (67, 292 & 2056 PPM) PRODUCED KIDNEY DAMAGE & KIDNEY TUMORS IN MALE RATS BUT NOT IN FEMALE RATS OR MALE AND FEMALE MICE. FEMALE MICE DEVELOPED A SLIGHTLY HIGHER INCIDENCE OF LIVER TUMORS COMPARED TO CONTROLS AT THE HIGHEST EXPOSURE LEVEL. SINCE THESE RESPONSES ARE SPECIES SPECIFIC AND HAVE NOT BEEN OBSERVED IN HUMANS, THEIR BIOLOGIC SIGNIFICANCE AS IT RELATES TO HUMAN HEALTH IS DIFFICULT TO INTERPRET AT THIS TIME. THE AMERICAN PETROLEUM INSTITUTE IS CURRENTLY CONDUCTING STUDIES TO HELP ANSWER THESE QUESTIONS. CHRONIC HUMAN HEALTH EFFECTS WOULD NOT BE EXPECTED AS LONG AS GOOD PERSONAL HYGIENE AND PROPER SAFETY PRECAUTIONS ARE PRACTICED.

PROLONGED AND REPEATED OVEREXPOSURE TO BENZENE MAY PRODUCE INJURY TO THE BLOOD-FORMING TISSUES CAUSING BLOOD ABNORMALITIES AND POSSIBLY LEUKEMIA; HOWEVER, EXPOSURES TO SUCH HIGH LEVELS ARE NOT LIKELY TO BE ENCOUNTERED IN TYPICAL GASOLINE HANDLING OPERATIONS DUE TO THE COMPARATIVELY LOW BENZENE CONTENT.

EMERGENCY FIRST AID PROCEDURES

EYE:

FLUSH EYES WITH LARGE AMOUNTS OF WATER FOR AT LEAST 15 MINUTES. IF SYMPTOMS OR IRRITATION OCCUR, CALL A PHYSICIAN.

SKIN:

WASH WITH SOAP AND LARGE AMOUNTS OF WATER. REMOVE CONTAMINATED CLOTHING. IF SYMPTOMS OR IRRITATION OCCUR, CALL A PHYSICIAN.

INHALATION:

MOVE PERSON TO FRESH AIR. IF NOT BREATHING OR IF NO HEARTBEAT, GIVE ARTIFICIAL RESPIRATION OR CARDIOPULMONARY RESUSCITATION (CPR). IMMEDIATELY CALL A PHYSICIAN.

INGESTION:

DO NOT INDUCE VOMITING. DO NOT GIVE LIQUIDS. IMMEDIATELY CALL A PHYSICIAN.

SECTION 6 - SPECIAL PROTECTION INFORMATION

VENTILATION:

LOCAL OR GENERAL EXHAUST REQUIRED IN ENCLOSED AREAS OR WITH INADEQUATE VENTILATION.

PRODUCT NAME: GASOLINE, REGULAR UNLEADED.
MARATHON MSDS NO: 115MAR003

SECTION 6 - SPECIAL PROTECTION INFORMATION (CON'T)

RESPIRATORY PROTECTION:

APPROVED ORGANIC VAPOR CHEMICAL CARTRIDGE OR SUPPLIED AIR RESPIRATORS SHOULD BE WORN FOR EXPOSURES EXCEEDING THE TLV OR STEL. OBSERVE RESPIRATOR PROTECTION FACTOR CRITERIA IN ANSI Z88.2 (1980).

PROTECTIVE GLOVES:

NEOPRENE, NITRILE OR PVA GLOVES FOR REPEATED OR PROLONGED SKIN EXPOSURE.

OTHER PROTECTIVE EQUIPMENT:

USE EXPLOSION-PROOF EQUIPMENT.

SECTION 7 - SPILL OR LEAK PROCEDURES

ENVIRONMENTAL EFFECTS:

LIQUID CAN BE TOXIC TO AQUATIC LIFE.

STEPS TO BE TAKEN IN CASE OF SPILL, LEAK OR RELEASE:

KEEP PUBLIC AWAY. SHUT OFF SOURCE IF POSSIBLE TO DO SO WITHOUT HAZARD. ELIMINATE ALL IGNITION SOURCES. ADVISE NATIONAL RESPONSE CENTER (800-424-8802) IF PRODUCT HAS ENTERED A WATERCOURSE. ADVISE LOCAL & STATE EMERGENCY SERVICES AGENCIES, IF APPROPRIATE. CONTAIN LIQUID WITH SAND OR SOIL. RECOVER AND RETURN FREE LIQUID TO SOURCE. USE SUITABLE SORBENTS TO CLEANUP RESIDUAL LIQUIDS.

WASTE DISPOSAL METHOD:

DISPOSE OF CLEANUP MATERIALS IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS.

SECTION 8 - HANDLING AND STORAGE PRECAUTIONS

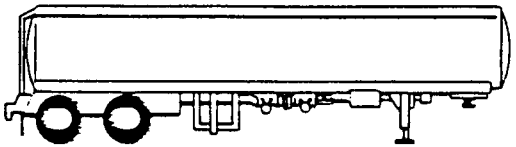
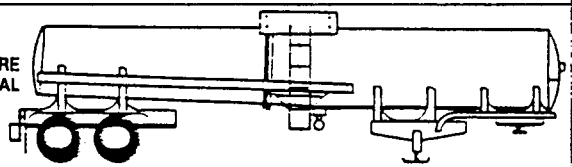
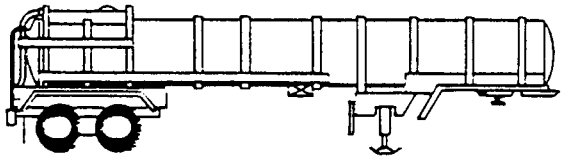
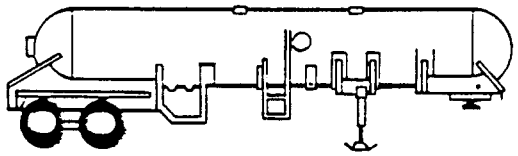
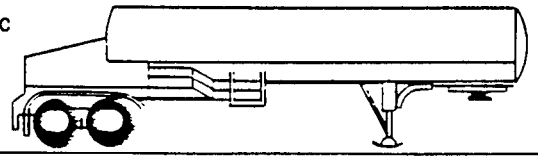
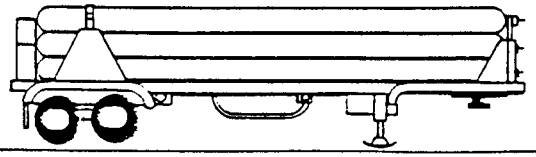
USE APPROPRIATELY GROUNDED DISPENSING PRACTICES. STORE IN A RELATIVELY COOL PLACE. DO NOT EXPOSE TO HEAT, OPEN FLAMES OR OXIDIZERS.

SECTION 9 - HAZARD WARNING

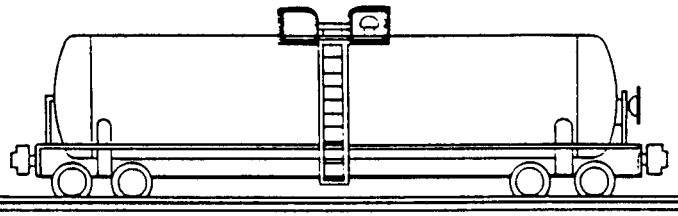
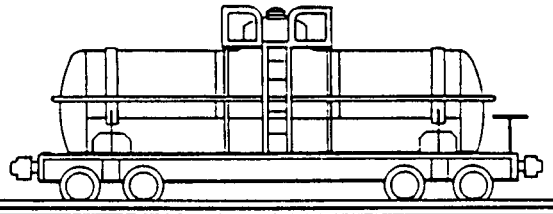
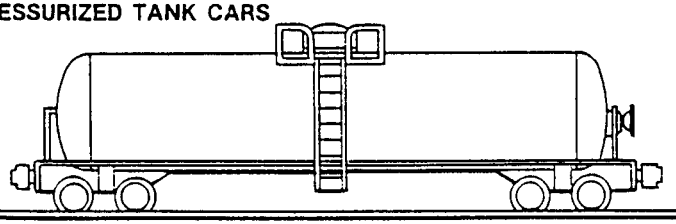
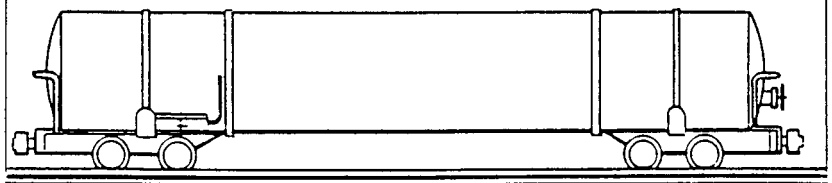
DANGER!

EXTREMELY FLAMMABLE
HARMFUL OR FATAL IF SWALLOWED
CONTAINS BENZENE THAT MAY BE POTENTIALLY TOXIC OR CARCINOGENIC

CARGO TANK TRUCKS

CONTAINER SHAPE	DESCRIPTION	CONTENTS
MC-306 ATMOSPHERIC PRESSURE CARGO TANK TRUCKS 	• OVAL CROSS SECTION INDICATES NON-PRESSURIZED TANK (LESS THAN 3 psi) • USUALLY SINGLE-SHELL, ALUMINUM CONSTRUCTION. OLDER STEEL CONSTRUCTED TANKS MAY BE FOUND. • GENERALLY 9,000 GALLONS MAXIMUM CAPACITY.	• TRANSPORTS PETROLEUM PRODUCTS (GASOLINE, FUEL OIL). CLASS B POISIONS.
MC-307 LOW-PRESSURE CHEMICAL CARGO TANK TRUCKS 	• CIRCULAR CROSS SECTION WITH PRESSURES UP TO 25 psi. • DOUBLE SHELL CONSTRUCTION WITH INSULATION THE MOST COMMON. • INSULATED TANKS MAY NOT APPEAR CIRCULAR IN CROSS SECTION. • ONE OR TWO COMPARTMENTS WITH OVERTURN PROTECTION. • GENERALLY 6,000 TO 7,000 GALLONS MAXIMUM CAPACITY.	• TRANSPORTS FLAMMABLE AND COMBUSTIBLE LIQUIDS, MILD CORROSIVES, MOST CHEMICALS, ETC.
MC-312 CORROSIVE CARGO TANK TRUCKS 	• CIRCULAR CROSS SECTION, SMALLER DIAMETER WITH EXTERNAL REINFORCING RIBS OFTEN VISIBLE. • MAY ALSO BE FOUND IN DOUBLE SHELL CONFIGURATION. • INSULATED TANKS MAY NOT APPEAR CIRCULAR IN CROSS SECTION. • OVERTURN AND SPLASH PROTECTION AT DOME COVER/VALVE LOCATIONS. • GENERALLY 5,000 TO 6,000 MAXIMUM CAPACITY.	• TRANSPORTS STRONG CORROSIVES.
MC-331 HIGH PRESSURE GAS CARGO TANK TRUCKS 	• CIRCULAR CROSS SECTION WITH ROUNDED ENDS OR HEADS. • SINGLE SHELL, NON-INSULATED TANK. • UPPER TWO-THIRDS PAINTED WHITE OR HIGHLY REFLECTIVE COLOR. • CAPACITY RANGES FROM 2,500 ("BOBTAIL" DELIVERY TRUCK) TO 11,500 GALLONS (CARGO TANK TRUCK).	• TRANSPORTS LP GASES AND ANHYDROUS AMMONIA (PARTICULARLY IN THE SPRING).
MC-338 CRYOGENIC LIQUID TANK TRUCKS 	• WELL-INSULATED "THERMOS BOTTLE" DESIGN WITH FLAT TANK ENDS. • DOUBLE SHELL TANK WITH RELIEF PROTECTION. • OFTEN HAVE VAPORS DISCHARGING NORMALLY FROM RELIEF VALVES.	• TRANSPORT CRYOGENIC LIQUIDS (E.G. LOX, LIQUID NITROGEN, LIQUID ARGON AND LIQUID CARBON DIOXIDE).
COMPRESSED GAS TRAILER 	• OFTEN REFERRED TO AS A "TUBE TRAILER". • CYLINDERS ARE STACKED AND MANIFOLDED TOGETHER. • MANIFOLD AT REAR. • PRESSURES RANGE FROM 3,000 TO 5,000 psi. • OFTEN FOUND AT CONSTRUCTION AND INDUSTRIAL SITES.	• TRANSPORTS COMPRESSED GASES (E.G. OXYGEN, NITROGEN, HYDROGEN).

RAILROAD TANK CARS

CONTAINER SHAPE	DESCRIPTION	CONTENTS
NON-PRESSURIZED TANK CARS  	• HORIZONTAL TANK WITH FLAT, OR NEARLY FLAT ENDS. • FITTINGS AND VALVING VISIBLE ON TOP OF CAR. • OLDER CARS WILL HAVE AN EXPANSION DOME WITH VISIBLE FITTINGS. • TANK PRESSURES LESS THAN 100 psi. • OFTEN HAS BOTTOM UNLOADING VALVES.	• TRANSPORTS WIDE VARIETY OF LIQUIDS, MOLTEN SOLIDS AND SOME LIQUEFIED GASES.
PRESSURIZED TANK CARS 	• HORIZONTAL TANK WITH ROUNDED ENDS. • FITTINGS AND VALVES ENCLOSED IN DOME. • OFF-WHITE PAINT INDICATES SPRAYED-ON THERMAL INSUALTION. • BLACK PAINT USUALLY WILL INDICATE A JACKETED TANK CAR.	• TRANSPORTS FLAMMABLE AND NON-FLAMMABLE COMPRESSED GASES AND CLASS A POISONS.
CRYOGENIC LIQUID TANK CARS 	• WELL-INSULATED "THERMOS BOTTLE" DESIGN. • DOUBLE SHELL TANK SIMILAR TO FIXED STORAGE TANKS. • TRANSPORT LOW-PRESSURE REFRIGERATED LIQUIDS (PRESSURES 25psig OR LOWER). • ABSENCE OF ANY TOP FITTINGS. • LOADING/UNLOADING FITTINGS AND SAFETY RELIEF DEVICE OFTEN FOUND IN CABINETS AT DIAGONAL CORNERS OR ON ONE END AT GROUND LEVEL.	• TRANSPORTS LIQUID OXYGEN, LIQUID HYDROGEN, LIQUID NITROGEN.

RAILROAD TANK CAR SPECIFICATION MARKING SYSTEM

DOT 111 A 60 AL W 1

- **OTHER CAR FEATURES**
  FITTINGS, MATERIALS, LININGS
- **TYPE OF WELD USED**
  "W" - FUSION WELDING
  "F" - FORGE WELDING
- **TYPE OF MATERIAL USED IN TANK CONSTRUCTION**
  "NO LETTER" - CARBON STEEL
  "AL" - ALUMINUM (CLASSES 103, 105, 109 & 11)
  "A-AL" - ALUMINUM ALLOY
  "N" - NICKEL
  "C", "D" OR "E" - STAINLESS STEEL (ALLOY/STEEL)
- **TANK TEST PRESSURE (PSI)**
- **SEPARATOR CHARACTER**
  SIGNIFICANT ONLY FOR CLASS 105, 112, 113, 114 TANK CARS AND SOME 111 TANK CARS WHEN RETROFITTED.
  "A" - TOP AND BOTTOM SHELF COUPLERS
  "S" - TANK HEADSHIELDS, TOP AND BOTTOM SHELF COUPLERS
  "J" - JACKETED THERMAL PROTECTION, TANK HEADSHIELDS, TOP AND BOTTOM SHELF COUPLERS
  "T" - SPRAY-ON THERMAL PROTECTION, TANK HEADSHIELDS, TOP AND BOTTOM SHELF COUPLERS
- **CLASS DESIGNATION**
  THE THREE DIGIT CLASS DESIGNATION FOLLOWS THE AUTHORIZING AGENCY.

  • NON-PRESSURE TANK CARS

DOT-103	AAR-201A
DOT-104	AAR-203W
DOT-111A	AAR-206
DOT-115	AAR-211A

  • PRESSURE TANK CARS

DOT-105	DOT-114
DOT-109	DOT-120A
DOT-112	

  • CRYOGENIC LIQUID TANK CARS

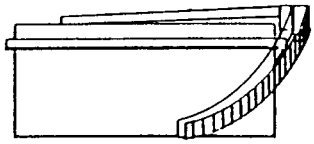
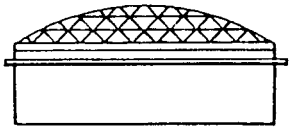
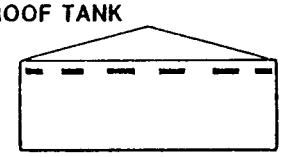
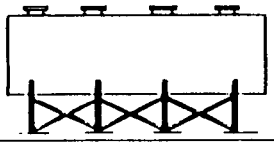
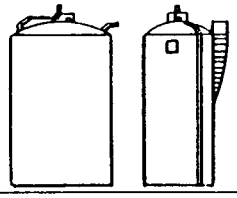
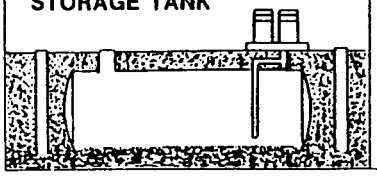
DOT-113	AAR 204W
	AAR 204X (INSIDE BOX CAR)

  • MISCELLANEOUS TANK CARS

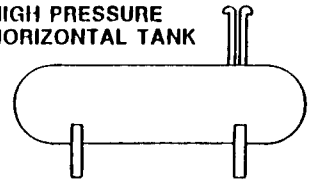
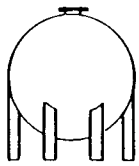
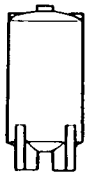
DOT-106A	DOT-110A	MULTI-UNIT TANK CAR TANKS
DOT-107A	HIGH PRESSURE TANK CAR	
AAR-207	PNEUMATICALLY UNLOADED COVERED HOPPER	
AAR-208	WOODEN TANK CAR	

- **AUTHORIZING AGENCY**
  TANK CAR SPECIFICATIONS START WITH THREE LETTERS DESIGNATING THE AGENCY UNDER WHOSE AUTHORITY THE SPECIFICATION WAS ISSUED
  - DOT - DEPARTMENT OF TRANSPORTATION
  - AAR - ASSOCIATION OF AMERICAN RAILROADS
  - ICC - INTERSTATE COMMERCE COMMISSION (REGULATORY AUTHORITY ASSUMED BY DOT IN 1966)
  - CTC - CANADIAN TRANSPORT COMMISSION

ATMOSPHERIC AND LOW PRESSURE LIQUID STORAGE TANKS

CONTAINER SHAPE	DESCRIPTION	CONTENTS
CONE ROOF TANK 	• TANK WITH VERTICAL CYLINDRICAL WALLS SUPPORTING A FIXED, INVERTED CONE ROOF. • OPERATES AT ATMOSPHERIC PRESSURE. • MAY HAVE INSULATION, PARTICULARLY FOR HEAVY FUEL OIL AND ASPHALT SERVICE. • IF CONSTRUCTED TO API 650 SPECIFICATIONS, ROOF-TO-SHELL SEAM DESIGNED TO FAIL IN CASE OF FIRE OR EXPLOSION.	• STORES FLAMMABLE, COMBUSTIBLE AND CORROSIVE LIQUIDS.
OPEN FLOATING ROOF TANK 	• WIND GIRDER AROUND TOP OF TANK SHELL. • LADDER ON ROOF. • ROOF ACTUALLY FLOATS ON LIQUID SURFACE.	• STORES FLAMMABLE AND COMBUSTIBLE LIQUIDS.
OPEN FLOATING ROOF TANK WITH GEODESIC DOME 	• OPEN FLOATING ROOF WITH LIGHTWEIGHT ALUMINUM GEODESIC DOME.	• STORES FLAMMABLE LIQUIDS.
COVERED FLOATING ROOF TANK 	• ALSO REFERRED TO AS AN INTERNAL FLOATING ROOF. • CONE ROOF TANK WITH AN INTERNAL FLOATING ROOF. • LARGE VENTS FOUND AT THE TOP OF THE TANK SHELL.	• STORES FLAMMABLE AND COMBUSTIBLE LIQUIDS.
HORIZONTAL TANKS 	• HORIZONTAL, CYLINDRICAL TANK SITTING ON LEGS, BLOCKS, ETC. • STRUCTURAL INTEGRITY OF THE SUPPORTS IS CRITICAL. • OLDER TANKS HAVE BOLTED CONSTRUCTION: TANKS SINCE 1950S GENERALLY ARE WELDED.	• STORES FLAMMABLE AND COMBUSTIBLE LIQUIDS, CORROSIVES, POISONS, ETC.
DOME ROOF TANKS 	• TANK WITH VERTICAL CYLINDRICAL WALLS SUPPORTING A FIXED DOME-SHAPED ROOF. • OPERATING PRESSURE OF 2.5 TO 15 psi. • ROOF WILL NOT ALWAYS FAIL AS DESIGNED.	• STORES FLAMMABLE AND COMBUSTIBLE LIQUIDS, FERTILIZERS, CHEMICAL SOLVENTS, ETC.
UNDERGROUND STORAGE TANK 	• HORIZONTAL TANK CONSTRUCTED OF STEEL, FIBERGLASS, OR STEEL WITH FIBERGLASS COATING. • ANY TANK WITH GREATER THAN 10% SURFACE AREA UNDERGROUND IS CONSIDERED AN UNDERGROUND TANK. • VISIBLE CLUES ARE VENTS, FILL POINTS AND POTENTIAL OCCUPANCY/LOCATIONS (E.G. SERVICE STATION, FLEET MAINTENANCE).	• PRIMARILY STORES PETROLEUM PRODUCTS.

PRESSURIZED STORAGE VESSELS

CONTAINER SHAPE	DESCRIPTION	CONTENTS
HIGH PRESSURE HORIZONTAL TANK 	• GENERALLY SINGLE SHELL, NON-INSULATED TANK. • ROUNDED ENDS INDICATE HIGH PRESSURE. • PAINTED WHITE OR HIGHLY REFLECTIVE COLOR. • SIZE VARIES WITH OCCUPANCY—1,000 TO 30,000+ GALLONS.	• STORES LP GASES, ANHYDROUS AMMONIA, HIGH VAPOR PRESSURE FLAMMABLE LIQUIDS.
HIGH PRESSURE SPHERICAL STORAGE TANKS 	• SINGLE SHELL, NON-INSULATED TANK. • PAINTED WHITE OR HIGHLY REFLECTIVE COLOR. • CAPACITIES TO 600,000 GALLONS. • MAY HAVE WATER SPRAY SYSTEM FOR FIRE PROTECTION.	• STORES LP GASES.
CRYOGENIC LIQUID STORAGE TANKS 	• WELL-INSULATED "THERMOS BOTTLE" DESIGN. • PRIMARILY FOUND AT HEAVY INDUSTRIAL FACILITIES, HOSPITALS, GAS PROCESSING FACILITIES, ETC. • CAPACITIES TO 400,000+ GALLONS.	• STORES LIQUID OXYGEN (LOX), LIQUID NITROGEN, LIQUID CARBON DIOXIDE, ETC.

GLOSSARY OF HAZARDOUS MATERIAL TERMINOLOGY

Abatement — The actions taken to reduce the amount, degree of the hazard, or intensity of the release or threatened release of a hazard.

Absolute Pressure — Gauge pressure plus atmospheric pressure, abbreviated P.S.I.A. (true pressure).

Absorbent Material — A material designed to pick up and hold liquid hazardous material to prevent contamination spread.

Absorption — Taking in toxic material by contact with the skin.

The process of "picking up" a liquid hazardous material to prevent enlargement of the contaminated area.

Acceptable Risk — A risk, judged to be outweighed by corresponding benefits, or one that is of such a degree that it is considered to pose diminished potential for adverse effects.

Access Control Point — The point of entry and exit which regulates access to and from control zones.

ACGIH — American Conference of Governmental Industrial Hygienists; an organization of professional personnel in governmental agencies or educational institutions engaged in occupational safety and health programs. ACGIH develops and publishes recommended occupational exposure limits (see TLV) for hundreds of chemical substances and physical agents.

Acid — One of a large class of chemical substances whose water solutions have one or more of the following properties: sour taste, ability to make litmus dye turn red and to cause other indicator dyes to change to characteristic colors, ability to react with and dissolve certain metals to form salts, and ability to react with bases or alkalies to form salts. All acids contain hydrogen. In water, ionization or splitting of the molecule occurs, so that some or most of this hydrogen forms H_3O_+ ions (hydronium ions), usually written more simply as H (hydrogen ion).

Acid Suits — Special protective clothing that prevents toxic or corrosive substances or vapors from coming in contact with the body.

Acute — Intense. Reaching a crisis rapidly.

Acute Effect — An intense effect to a human or animal body, caused by exposure to a chemical or physical agent, with symptoms developing rapidly. Also see 'chronic.'

Acute Toxicity — The extreme effects resulting from a single dose or exposure to a substance. Acute effects are defined by the American National Standard Institute (ANSI) Standards for Precautionary Labeling of Hazardous Industrial Chemicals (Z129.1-1982).

Adjuvant — A subsidiary ingredient or additive in a mixture (medicine,

flavoring, perfume, etc.,) which contributes to the effectiveness of the primary ingredient.

Adsorption — Process of adhering to a surface.

Aerosol — A dispersion of particles of microscopic size in a gaseous medium. Particles may be solid (dust, fume, smoke) or liquid (mist, fog).

Agency Representative — Individual assigned to an incident from an assisting or cooperating agency who has been delegated full authority to make decisions on all matters affecting that agency's participation at the incident. Agency representatives report to the incident liaison officer.

Air Bill — A shipping paper prepared from a bill of lading that accompanies each piece of an air shipment.

Air Inversion — A meteorological condition in the earth's atmosphere in which the temperature of the air some distance above the earth's surface is higher than the air temperature of the surface. Normally, air temperatures decrease progressively as altitude increases. Such a condition traps air and released gases and vapors near the earth's surface, thus impeding their dispersion.

Air Modeling — Mathematical models used to predict movement and concentrations of chemicals in the atmosphere.

Air Monitoring — The observation, recording, and/or detection of pollutants in ambient air.

Air-Reactive Materials — Substances that will ignite at normal temperatures when exposed to air.

Airborne Pollutants — Pollutants that are carried in air.

Allocated Resources — Resources dispatched to an incident that have not yet checked in with the incident communications system.

Ambient Temperature — The normal temperature of the environment.

ANSI — American National Standards Institute; a privately funded, voluntary membership organization that identifies industrial and public needs for national consensus standards and coordinates development of such standards. Many ANSI standards relate to safe design/performance of equipment such as safety shoes, eyeglasses, etc. and safe practices or procedures, such as noise measurement, testing of fire extinguishers and flame arrestors, etc.

API — American Petroleum Institute; voluntary membership organization of the petroleum industry. Among its services, API assists member committees in developing by the consensus process, and publishing, recommended practices for drilling and well servicing, storage tank installation, tank cleaning, piping and fittings, other industry-related design, installation and

operating practices; also funds and publishes basic reference books and manuals.

Asphyxiant — A vapor or gas which can cause unconsciousness or death by suffocation (lack of oxygen). Asphyxiants are harmful to the body when they become so concentrated that they reduce the oxygen content in the air (normally about 21%) to dangerous levels (OSHA-19.5% or lower), or prevent the body from utilizing the oxygen breathed. Asphyxiants are one of the principal potential hazards of working in a confined space.

Asphyxiating Materials — Substances that can cause death through displacement of the oxygen in the air.

Assigned Protection Factor — see 'Protection Factor"

Assigned Resources — Resources checked in and assigned work tasks on an accident.

Assisting Agency — An agency directly contributing suppression, rescue, support, or service resources to another agency.

ASTM — American Society for Testing and Materials; voluntary membership organization with members from a broad spectrum of individuals, agencies, and industries concerned with materials. The world's largest source of voluntary consensus standards for materials, products, systems, and services. ASTM is a resource for sampling and testing metho0ds, health and safety aspects of materials, safe performance guidelines, effects of physical and biological agents and chemicals.

Available Resources — Resources assigned to an incident, available for assignment.

Barrel — 42 U.S. gallons

BLEVE — Boiling Liquid Expanding Vapor Explosion. A container failure with a release of energy, often rapidly and violently, accompanied by a release of gas to the atmosphere, followed by ignition (fireball) and propulsion of the container or container pieces.

Boiling Point — The temperature at which a liquid changes to a vapor state, at a given pressure; usually expressed in degrees Fahrenheit at sea level pressure (760 mm Hg, or one atmosphere). For mixtures, the initial boiling point or the boiling range may be given. Flammable materials with low boiling points generally present extreme fire hazards.

Boilover — The violent expulsion of oil and froth from a tank due to the rapid expansion of water into steam when the heat wave in the oil reaches the water layer, usually suspended toward the bottom of a tank of heavy or unrefined oil.

BOM or BuMines — Bureau of Mines of the U.S. Department of Interior. BuMines began approving air breathing apparatus in 1918, later added all types of respirators. BOM's respirator testing/approval activities have been discontinued; NIOSH now has this responsibility.

Branch — That organizational level having functional/geographic responsibility for major segments of incident operations. The branch-level is organizationally between the section and division group.

Breakthrough — The penetration of challenge material(s) through a gas or a vapor air-purifying element or fabric. The quantity or extent of breakthrough during service life is often referred to as the percentage of the input concentration.

Bulk Container — A cargo container such as that attached to a tank truck or tank car, used for transporting materials in bulk quantities.

Bulk Plant — That portion of a property where flammable or combustible liquids are received by tank vessel, pipe line, tank cars, or tank vehicle, and are stored or blended in bulk for the purpose of distributing such liquids by tank vessel.

Bung — A cap or screw used to cover the small opening in the top of a metal drum or barrel.

'C' or Ceiling — The maximum allowable human exposure limit (not to be exceeded) for an airborne substance. Also see "PEL" and "TLV."

CAA — Clean Air Act; Federal law enacted to regulate/reduce air pollution. Administered by the Environmental Protection Agency (EPA).

CAS — Chemical Abstract Service; A Columbus, Ohio organization which indexes information published in 'Chemical Abstracts' by the American Chemical Society, and provides index guides by which information about particular substances may be located in the "Abstracts" when needed. CAS numbers identify specific chemicals.

Camp — A geographical site, within the general incident area, separate from the base, equipped and staffed to provide food, water, and sanitary services to incident personnel.

Carboy — A bottle or rectangular container for liquids of 5 to 15 gallons capacity that is made of glass, plastic, or metal and is often cushioned in a protective container.

Carcinogen — A substance or agent capable of causing or producing cancer in mammals. (See also 'Potential Occupational Carcinogen')

Carcinogenisis — The growth process of cancer as a result of exposure to a particular substance or agent.

Cargo Manifest — A shipping paper that contains all of the contents being carried by the transporting vehicle or vessel.

cc — Cubic centimeter; a volume measurement in the metric system, equal in capacity to one milliliter (ml). One quart is about 946 cc.

Check-in — Locations where assigned resources check-in at an incident.

The locations are: incident command post (resources unit), incident base, camps, staging areas, helibases, and division supervisors (for direct line assignments).

Chemical Family — A group of single elements or compounds with a common name. Example: acetone, methyl ethyl ketone (MEK), and methyl isobutyl ketone (MIBK) are of the ketone family.

CHEMTREC — Chemical Transportation Emergency Center; a national center established by the Chemical manufacturers association (CMA) in Washington, DC, in 1970, to relay pertinent emergency information concerning specific chemicals on request.

Chronic Effect — An adverse effect on a human or animal body, with symptoms which develop slowly over a long period of time and exposure to a chemical or physical agent. Also see "acute."

Chronic Toxicity — Adverse effects resulting from repeated doses of or exposures to a substance over a relatively prolonged period of time. Ordinarily used to denote effects in experimental animals.

Class A Explosive — A material or device that presents a maximum hazard and functions by detonation.

Class A Poison — A poisonous gas or liquid of such nature that a very small amount of the gas, or vapor of the liquid, is dangerous to life.

Class B Explosive — A material or device that presents a flammable hazard and functions by deflagration.

Class B Poison — Liquids or solids (other than Class A Poisons or Irritating Materials) which are known to be so toxic to humans as to afford a hazard to health during transportation.

Class C Explosive — A material or device that contains restricted quantities of either Class A or Class B explosives or both, but presents a minimum hazard.

Clear Text — The use of plain English in radio communication transmissions. No ten codes, or agency specific codes, are used when using clear text.

CO — Carbon Monoxide, a colorless, odorless, flammable and very toxic gas produced by the incomplete combustion of carbon; also a by-product of many chemical processes; an asphyxiant.

CO_2 — Carbon Dioxide, a heavy, colorless gas produced by incomplete combustion and decomposition of organic substances, and as a by-product of many chemical processes. CO_2 will not burn and is relatively non-toxic (although high concentrations, especially in confined spaces, can create hazardous oxygen deficient environments).

COC — Cleveland Open Cup; a flash point test method.

Code of Federal Regulations (CFR) — The formal name given to those books or documents that contain the specific regulations provided for by the law.

Cold Zone — This area contains the command post and such other support functions as are deemed necessary to control the incident. This is also referred to as the clean zone or support zone.

Combustible — A term used by NFPA, DOT, and others to classify certain liquids that will burn, on the basis of flash points. In the Hazard Communication Rules, a combustible liquid has a flash point at or above 100°F (37.8°C), but below 200°F. Also, see combustible liquid in OAR 437-155-005(6).

Combustible Liquid — Any Liquid having a flash point at or above 100°F.

Combustion explosion — Sudden fracture of a container or structure accompanied by a shock wave (sound). Combustion of a flammable mixture within a container or structure producing a gas pressure greater than the container or structure can withstand.

Comm Unit (Communications unit) — A vehicle (trailer or mobile van) used to provide the major part of an incident communications center.

Command — The act of directing, ordering, and/or controlling resources by virtue of explicit legal, agency, or delegated authority.

Command Staff — The Command Staff consists of the Information Officer, Safety Officer, and Liaison Officer. They all report directly to the Incident Commander.

Company — Any piece of equipment having a full complement of personnel.

Compressed Gas — Any material which, when enclosed in a container, has an absolute pressure exceeding 40 psi at 70 degrees Fahrenheit (or) exceeding 140 psi at 130 degrees Fahrenheit.

Compressed gas in Solution — A non-liquefied gas that is dissolved in a solvent, but in a solution at high pressures (e.g., acetylene).

Concentration — The relative amount of a substance when combined or mixed with other substances. (e.g., 2 parts per million (ppm) hydrogen sulfide in air; or a 50 percent caustic solution.)

Confinement — Those procedures taken to keep a material in a defined or local area.

Consignee — The person who is to receive a shipment.

Consist — A rail shipping paper similar to a cargo manifest. It may contain a list of the cars in the train, in order or a list of those cars carrying hazmats and their location on the train.

Container — Any bag, barrel, bottle, box can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous mate-

rial.

Container Specification Number — A number found on a shipping container preceded by the initials "DOT" which indicate that the container has been built according to Federal specifications.

Containment — Those procedures taken to keep a material in its container.

Contamination — Staining or polluting that occurs by physical contact with another substance.

Control — The procedures, techniques and methods used in the mitigation of a hazardous materials incident, including containment, extinguishment and confinement.

Control Agent — Any material that is used to contain or extinguish a hazardous material or its vapors.

Control Zones — The designation of areas at a hazardous materials incident based upon safety and the degree of hazard.

Cooperating Agency — An agency supplying assistance other than direct suppression, rescue, support or service functions to the incident control effort (e.g., Red Cross, law enforcement agency, telephone company, etc.,)

Coordination — The process of systematically analyzing a situation, developing relevant information, and informing appropriate command authority (for its decision) of viable alternatives for selection of the most effective combination of available resources to meet specific objectives. The coordination process (which can either be intra- or inter-agency) does not in and of itself involve command dispatch actions. However, personnel responsible for coordination may perform command or dispatch functions within limits as established by specific agency delegations, procedures, legal authority, etc.,

Corrective Actions — Actions taken by the Incident Commander to correct the problem at hand during a hazmat emergency.

Corrosive — As defined by DOT in *Appendix A to 49 CFR Part 173*, a corrosive material is "…a liquid or solid that causes visible destruction or irreversible alterations in human skin tissue at the site of contact; or, in the case of leakage from its packaging, a liquid that has a severe corrosion rate on steel. *See Appendix A in Hazard Communication Rule, Section 2, page 19.*"

CPSC — *Consumer Products Safety Commission*, a federal agency with responsibility for regulating hazmats when they appear in consumer goods. For CPSC purposes, hazards are defined in the *Hazardous Substances Act* and the *Poison Prevention Packaging Act of 1970*.

Cryogenic Liquid — Gases which must be cooled to a very low temperature to bring about a change from gas to liquid. Stored at temperatures

from –150°F to absolute zero (-459. °F).

Cutaneous Toxicity — See "Dermal Toxicity."

CWA — Clean Water Act. Federal law enacted to regulate/reduce water pollution. Administered by EPA.

Dangerous Cargo Manifest — A cargo manifest used on ships that contains a list of all the hazardous materials on board, including their locations.

Decomposition — Breakdown of a material or substance (by heat, chemical reaction, electrolysis, decay, or other processes) into parts, elements or simpler compounds.

Decontamination (contamination reduction) — The physical and/or chemical process of reducing and preventing the spread of contamination from persons and equipment used at a hazmat incident.

Decontamination Area — The area, usually located within the *warm zone*, where decontamination takes place.

Deflagration — Burning which takes place at a speed below the speed of sound.

Degradation — A chemical action involving the molecular breakdown of a protective clothing material due to contact with a chemical. The term "degradation" may also refer to the molecular breakdown of the spilled or released material to render it less hazardous.

Demonstrate — To show, by actual use. This may be supplemented by simulation, explanation, illustration or a combination of these.

Dermal Toxicity
Dermal — Adverse effects resulting from skin exposure to a substance
Used on, or applied to, the skin.

Detonation — A wave that passes along the body of an explosive, instantaneously converting the explosive into.

DHHS — US Department of Health and Human Services, which was created in 1980 to replace the US Department of Health, Education and Welfare (DHEW) as 'parent' for NIOSH, Public Health Service, and other agencies related to health and safety.

Dikes — Temporary walls constructed to halt the flow of a liquid substance. Also, earthen or concrete walls surrounding oil tanks, designed to catch overflow from the tanks and relieve the danger of flowing flammable liquids spreading to other exposures.

Dispatch — The implementation of a command decision to move a resource or resources from one place to another.

Dispatch Center — A facility from which resources are directly assigned to an incident.

Disposable Respirators — A respirator that is discarded after the end of its recommended

	period of use, after excessive resistance or physical damage, or when odor-breakthrough or other warning indicators render the respirator unsuitable for further use.
Division	That organization level having responsibility for operations within a defined geographic area or with functional responsibility. The division level is organizationally between the strike team and the branch. (See also Group)
DOL	US Department of Labor; includes the Occupational Safety and Health Administration (OSHA).
Dome	The circular cover on the top of a tank car that contains valves and relief valves.
DOT	US Department of Transportation; regulates transportation of chemicals and other substances for the protection of the public; law enforcement, and emergency response personnel, particularly when transportation incidents occur.
Dozer Company	Any dozer with a minimum complement of two persons.
Dust	A solid, mechanically produced particle with a size ranging from submicroscopic to macroscopic.
Dust and Mist Respirators	Respirators approved for the use against dusts or mists that may cause pneumoconiosis and fibrosis.
Emergency Respirator Use Situation	A situation that requires the use of respirators due to the unplanned generation of a hazardous atmosphere (often of unknown composition) caused by an accident, mechanical failure, or other means and that requires evacuation of personnel or immediate entry for rescue or corrective action.
Emergency Shut-Off Lever	A means of operating a valve that stops the flow of Substance.
Endangered Persons	Those persons who are in the exposure area created by a hazardous materials incident.
Engine	Any ground vehicle providing specific levels of pumping, water, and hose capacity but with less that the specified level of personnel.
Engine company	Any ground vehicle providing specified levels of pumping, water, hose capacity, and personnel.
EPA	US Environmental Protection Agency; Federal agency with environmental protection regulatory and enforcement authority. Administers CAA, CWAct, FIFRA, RCRA, TSCA, CERCLA, other federal environmental laws.
Epidemiology	The science which deals with the study of disease in a general population. Determination of the incidence (rate of occurrence) and distribution of a particular disease (as by age, sex, race, or occupation) may provide information about the causes of the

disease.

Equilibrium — (1) Chemical equilibrium is a condition in which a reaction and its opposite or reverse reaction occur at the same rate, resulting in a constant concentration of reactants; for example, ammonia synthesis is at equilibrium when ammonia molecules form and decompose at equal velocities ($N_2 + 3H_2 \hat{U} 2NH_3$). (2) Physical equilibrium is exhibited when two or more phases of a system are changing at the same rate so that the net change in the system is zero.

Escape Gas Mask — A gas mask that consists of a half-mask facepiece or mouthpiece, a canister, and associated connections and that is designed for use during escape only from hazardous atmospheres.

Escape Only Respirator — Respiratory devices that are designed for the use during escape from hazardous atmospheres.

Etiologic Agent — A living microorganism that may cause human disease.

Evaporation Rate — The rate at which a particular material will vaporizeas compared to the rate of vaporization of a known material. The evaporation rate can be useful in evaluating the health and fire hazards of a material. The known material is usually butyl acetate (n-BuAc), with a vaporization rate designated as 1.0. Vaporization rates of other solvents or materials are then classified as: FAST evaporating if greater than 3.0 (examples: Methyl Ethyl Ketone (MEK)=3.8, Acetone=5.6, Hexane=8.3); MEDIUM evaporating if 0.8 to 3.0 (examples: 190 proof Ethyl Alcohol-1.4, VM&P Naptha=1.4, MBK=1.6); SLOW evaporating if less than 0.8 (examples: Xylene=.6, Isobutyl Alcohol=.6, Normal Butyl Alcohol=.4, Water=.3, Mineral Spirits=.1).

Excess Flow Valve — A safety valve designed to shut-off the flow of a liquid when the flow exceeds a pre-set rate.

Explosive — A material capable of burning or bursting suddenly and violently.

Explosive Limits — All concentrations of a mixture of flammable vapor or gas in air, usually expressed in percent by volume, in which a flash will occur or a flame will travel if the mixture is ignited. (Also known as ‘flammable limits’)

Exposures — People, the environment or property that are or that may be exposed to the harmful effects of a hazardous materials emergency.

FDA — The U.S. Food and Drug Administration; under the provisions of the Federal food, Drug and Cosmetic Act, the FDA establishes requirements for the labeling of foods and drugs to protect consumers from misbranded, unwholesome, ineffective, and hazardous products. FDA also regulates materials for food contact service and the conditions under which such materials are approved.

Feedback — An element of a system that is the return of a portion of the output to the input. This allows the system to evaluate itself.

FIFRA — Federal Insecticide, and Rodenticide Act, regulations administered by EPA under this Act require that certain useful poisons, such as chemical pesticides, sold to the public contain labels that carry health hazard warnings to protect users.

Filtering Facepiece — A particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium. (See "Single-use dust" or "Dust and mist respirators" and "Disposable respirators")

Fire Point — The lowest temperature of a liquid at which vapors are evolved fast enough to support continuous combustion.

Fit Factor — A quantitative measure of the fit of a specific respirator facepiece to a particular individual.

Flame Impingement — The points where flames contact the surface of a container.

Flammable — A "flammable liquid" is defined by NFPA and DOT as a liquid with a flash point below 100^0 F. (37.8^0 C.). Solids which will ignite readily or are liable to cause fires under ordinary conditions of transportation through friction or retained heat from manufacturing or processing, and which burn so vigorously and persistently as to create a serious transportation hazard, are classified by DOT as "flammable solids." Also see "combustible." See OAR 437-155-055(16).

Flammable Gas — In order to be considered a 'flammable' gas, a chemical must have an LFL of 13% or below, or a flammable range of 12%. (U.S. DOT)

Flammable Limits — See "explosive limits"

Flammable Liquid — Any liquid having a flash point below 100^0 F.

Flammable Material — A substance that is capable of being easily ignited and of burning rapidly.

Flammable Solid — Any material, other than an explosive, that is liable to cause fires through friction, retained heat from manufacturing or processing, or that can be ignited readily and when ignited burns so vigorously and persistently as to create a serious transportation hazard.

Flash Point — The lowest temperature at which a liquid substance gives off flammable vapors sufficient to form an ignitable mixture with air near the surface of the liquid. Combustion is not continuous at the flash point. There are several flash point test methods, and flash points may vary for the same material depending on the method used, so the test method is indicated when the flash point is given (e.g., 150° PMCC, 200° TCC, etc.). See OAR 437-155-005(17).

Flashback — Re-ignition of flammable liquid caused by exposure of its va-

pors to an ignition source.

Floating Roof — A type of roof used on oil tanks to stop evaporation loss and reduce the fire hazard by reducing the vapor space over the liquid.

Food Dispenser — Any vehicle capable of dispensing food to incident personnel.

Formula — The conventional scientific designation for a material (water is H_2O, sulfuric acid is H_2SO_4, sulfur dioxide is SO_2, etc.,)

Frothover — A steady, slow frothing over of a tank without the sudden action that occurs in a boilover.

Fuel Tender — Any vehicle capable of supplying fuel to ground or airborne equipment.

Fume — A solid condensation particulate, usually of vaporized metal.

Fusible Plugs — A safety relief device in the form of a plug of low melting metal. The plugs close the safety relief device channel under normal conditions, and are intended to yield or melt at a set temperature to permit the escape of gas.

G/kg — Grams per kilogram. An expression of dose used in oral and dermal toxicology testing, to indicate the grams of substance dosed per kilogram of animal body weight. Also see "Kg" (kilogram).

Gas — A formless atmosphere which occupies completely a space or an enclosure. An aeriform fluid that is in a gaseous state at a standard temperature and pressure.

Gauge Pressure — The pressure read on a gauge, which does not take atmospheric pressure into account. The abbreviation for this pressure is "PSIG."

General Exhaust — A system for exhausting air containing contaminants from a general work area. Also see "local exhaust."

General Staff — The group of incident management personnel comprising *Incident Commander, Logistics Chief, Operations Chief, Finance Chief, Planning Chief.*

g — Gram. A metric unit of weight. One ounce UIS (avoirdupois) is about 28.4 grams.

Group — A functional division (e.g., *air support, salvage, structure protection,* etc.,)

Half-Life — The time required for an unstable element or nuclide to lose one-half of its radioactive intensity in the form of alpha, beta and gamma radiation. It is a constant for each radioactive element or nuclide. Half-lives vary from fractions of a second for some artificially produced radioactive elements to millions of years. The half-life of Uranium 235, for example, is

710,000,000 years.

Hatch Plan — A schematic drawing of the location of all cargo on a ship (also referred to as a stowage plan).

Hazard Class — A group of materials as designated by US DOT, that share a common major hazardous property, e.g., radioactivity, flammability.

Hazard Sector — That function of an overall Incident Command System that deals with the actual mitigation of a hazardous materials incident. It is directed by a sector officer and principally deals with the technical aspects of the incident. *(Note: this term is not consistent with NIIMS terminology)*

Hazard Sector Officer — The person responsible for the management of the hazard sector. *(Note: this term is not consistent with NIIMS terminology).*

Hazard/Hazardous — Capable of posing an unreasonable risk to health, safety, or the environment. Capable of doing harm.

Hazardous Chemical — Any chemical which is a physical or a health hazard. *In the Hazard Communications rules, see the definition for health hazard in OAR 437-155-005(21) and Appendix A, "Health Hazard Definitions."*

Hazardous Material — A substance that poses an unreasonable risk to life, the environment, or property, when released from its container. *(See specific regulatory definitions in Appendix A of NFPA 472).*

Hazardous Materials Response Team — A group of trained response personnel operating under an emergency response plan and appropriate standard operating procedures to control or otherwise minimize or eliminate the hazards to people, property, or the environment from a released hazardous material.

Heat Wave — A layer of hot liquid in a tank produced by the heat of the burning vapor at the top of the tank. As the burning progresses, this layer becomes thicker, extending down into the liquid in

the tank.

Heavy Equipment Transport — Any ground vehicle capable of transporting a dozer.

Helibase — A location within the general incident-area for parking, fueling, maintenance and loading of helicopters.

Helibase Crew — A crew of three or more individuals who may be assigned to operations or to support helicopter operations.

Helicopter Tender — A ground service vehicle capable of supplying fuel and support equipment to helicopters.

Helispot — A location where a helicopter can take off and land. Some helispots may be used for temporary retardant loading.

High Temperature Protective Clothing — Protective clothing designed to protect the wearer for short-term high-temperature exposures. This type of clothing is usually of limited use in dealing with chemical commodities.

Hot Zone — The area immediately surrounding a hazardous materials incident which extends far enough to prevent adverse effects from hazardous materials releases to personnel outside the zone. This zone is also referred to as the *exclusion zone* or *restricted zone*.

IDLH — *Immediately Dangerous to Life and Health*. The maximum level of concentration from which one could escape within thirty

Ignitable — Capable of being set afire.

Ignition Temperature — The minimum temperature to which a substance must be heated in order to initiate self-sustained combustion (burning).

Incident — An occurrence or event—either human-caused or natural phenomenon—that requires action by emergency service personnel to prevent or minimize loss of life or damage to property and/or natural resources.

Incident Action Plan — The incident action plan which is prepared at the initial meeting of incident command, contains general control objectives reflecting the overall incident strategy and specific action plans for the subsequent operational period. When complete, the incident action plans will have a number of attachments.

Incident Base — That location at which the primary logistics functions are coordinated and administered. (The specific incident name or other designator will be added to "base" at the time of an incident.) The incident command post may be co-located with the

	base. There is only ever one base per incident.
Incident Command Post (ICP)	That location at which the primary command functions are executed and usually co-located with the incident base.
Incident Command System (ICS)	The combination of facilities, equipment, personnel, procedures and communications, operating within a common organizational structure, with responsibility for the management of assigned resources to effectively accomplish stated objectives pertaining to an incident.
Incident Commander	The person responsible (and accountable) for all decisions relating to the management of an incident. The Incident Commander is in charge of an incident.
Incipient Fires	Fires that are in the beginning stages.
Incompatible	Materials which could cause dangerous reactions from direct contact with one another are described as "incompatible."
Individual Container	A cargo container such as a box or a drum, used to transport materials in small quantities.
Infrared (IR)	A heat detection system used for fire detection, mapping and hot spot identification.
Ingestion	The intake of a substance through the mouth.
Inhalation	Breathing a substance in the form of a gas, vapor, fume, mist or dust.
Inhibitor	A chemical which is added to another substance to prevent an unwanted chemical change from occurring involving hazardous materials. Detailed US DOT classification lists specify appropriate warning labels such as *Oxidizing Agent* or *Flammable Liquid* which must be used for various substances during transport.
Initial Attack	Resources initially committed to an incident.
Irritant	A substance which, by contact in sufficient concentration for a sufficient period of time, will cause an inflammatory response or reaction of the eye, skin or respiratory system. The contact may be a single exposure or multiple exposures. *See Appendix A, Hazard Communication Rule, Section 4.*
Irritating	An irritating material as defined by US DOT, is a liquid or solid substance which, upon contact with fire, or when exposed to air, gives off dangerous or intensely irritating fumes (not including poisonous materials.)
Jurisdictional Agency	The agency having jurisdiction and responsibility for a specific geographical area.
kg	Kilogram. A metric unit of weight...equivalent of about 2.2 US pounds.

l — Liter. A metric unit of volume. A US quart is about 9/10 of a liter.

Labels — Four-inch-square diamond-shaped markers required on individual shipping containers smaller than 640 cu. ft.

LC — Lethal Concentration. A concentration of a substance that will kill an animal upon inhalation.

LC_{50} — Lethal Concentration 50. The concentration of a material in air, which, on the basis of laboratory tests, is expected to kill 50 percent of a group of test animals when administered as a single exposure (usually one to four hours). The LC_{50} is expressed as parts of material per million parts of air (ppm), by volume for gases and vapors, or as micrograms of material per liter of air (mg/l), or milligrams of material per cubic meter of air (mg/m) for dusts, mists, gases and vapors.

LD — Lethal Dose. A concentration of a substance which will kill an animal by ingestion or skin contact.

LD_{50} — Lethal Dose 50. A single dose of a material, which, on the basis of laboratory tests, is expected to kill 50 percent of a group of test animals. The LD_{50} is expressed as milligrams or grams, or material per kilogram of animal body weight (mg/kg or g/kg).

LEL — Lower Explosive Limit. (also known as "LFL" or "Lower Flammable Limit") of a gas or vapor. The lowest concentration (lowest percentage of the substance in air) that will produce a flash of fire when an ignition source (heat, arc or flame) is present. At concentrations lower than the LEL, the mixture is too "lean" to burn. *See, also, "UEL.")*

LFL — Lower Flammable Limit. *(see LEL)*.

Light Ends — Petroleum products which have relatively low flashpoints and high vapor pressure. Common light ends are methane, ethane, propane and butane.

Liquefied Gas — A gas that is partially liquid at a temperature of 70°F.

Liquefied Petroleum Gas — Gases which can be liquefied under moderate pressures. Common LPGs are butane and propane.

Local Exhaust — A system for capturing and exhausting contaminants from the air at the point where the contaminants are produced (e.g., during welding, grinding, sanding). *(See also "General Exhaust")*

Low Pressure Tank — A storage tank which has been designed to operate at pressures above 0.5 psi but not more than 15 psi.

Lower Explosive Limit — See "LEL".

Lower Flammable Limit — See "LFL".

m_3 — Cubic Meter, or stere. A metric measure of volume equivalent to about 35.3 cubic feet or 1.3 cubic yards.

Management By Objective (MBO) — Top-down management designed so that all involved know and understand the objectives of the operation.

Material Safety Data Sheets (MSDS) — Documentation provided by manufacturers and compounders of chemicals with minimum information about chemical composition, physical and chemical properties, health and safety hazards, emergency response, and waste disposal, as required by OSHA 29 CFR 1910.120.

Mechanical Exhaust — A powered device — such as a motor-driven fan or air-stream Venturi tube — for exhausting contaminants from a workplace, vessel or enclosure.

Melting Point — The temperature at which a solid substance changes to a liquid state. For mixtures, the melting "range" may be given.

Message Center — The message center is part of the communications center and is co-located with it or adjacent to it. The center receives, records and routes information about resources, administration and tactical communications traffic.

mg — Milligram. A metric unit of weight. 1000 milligrams = 1 gram (g).

mg/m^3 — Milligrams per cubic meter. Unit for measuring concentrations of gases, vapors or particulates in air.

mg/kg — Milligrams per kilogram. An expression of toxicological dose.

Miscibility — A liquid's ability to mix with water.

Mist — A liquid condensation particle.

ml — Millileter. A metric unit of volume equal to one cubic centimeter or about 1/16 of a cubic inch. 1000 ml = one liter.

mm Hg — Millimeters of Mercury. A unit of measurement for low pressures or partial vacuums.

Mobilization Center — An off-incident location at which emergency service personnel and equipment are temporarily located pending assignment, release or re-assignment.

Monitoring equipment — Instruments and devices used to identify and quantify contaminants.

mppcf — Million particles per cubic foot. A unit for the measurement of particles of a substance suspended in air. Exposure limits for mineral dusts (silica, graphite, Portland Cement, nuisance dusts and others) are now expressed in mg/ml. ***mppcf is no***

longer the accepted measurement unit for exposure limits.

MSHA — The Mining Safety and Health Administration of the US Department of the Interior. The federal agency with authority over safety and health regulation for the mining industry.

Multi-Agency Coordination System (MACS) — The combination of facilities, equipment, personnel, procedures and communications integrated into a common system with responsibility for coordination of resources and support when more than one agency is involved in an emergency operation.

Mutagen — A substance or agent capable of altering the genetic material in a living cell.

Mutagenisis — Alteration of the inherited material.

N_2 — Nitrogen. A colorless, odorless and tasteless gas that will not burn and will not support combustion. The earth's atmosphere is about 78 percent nitrogen. At higher concentrations Nitrogen can displace Oxygen and become a lethal asphyxiant.

NaOH — Sodium Hydroxide, or Caustic Soda.

National Interagency Incident Management System (NIIMS) — Consists of five major subsystems which collectively provide a total systems approach to all risk incident management. The subsystems are: the incident command system; training; qualifications and certification; supporting technologies; and publications management.

NFPA — National Fire Protection Association. An international, voluntary organization dedicated to promoting and improving fire-protection and fire-prevention, and to establish safeguards against loss of life and property by fire. Best known on the industrial scene for the National Fire Codes - 16 volumes of codes, standards, recommended practices and manuals developed and periodically updated by NFPA technical committees.

NIOSH — National Institute for Occupational Safety and Health - part of the Public Health Service of the US Department of Health and Human Services. A federal agency which tests and certifies respiratory protective devices and air sampling detector tubes; recommends occupational exposure limits for various substances; and assists the Occupational Safety and Health Administration (OSHA) in occupational safety and health investigations and research.

NOAA Weather Station — A mobile weather data collection and forecasting facility provided by the National Oceanic and Atmospheric Administration, for utilization within the incident area.

Non-Flammable gas — A compressed gas not classified as flammable.

Non-Liquefied Gas — A gas that is entirely gaseous at a temperature of 70°F.

NOS — "Not Otherwise Stated" or "Not Otherwise Specified."

NO_X — Oxides of nitrogen. Undesirable air pollutants, NO_X emissions are regulated by EPA under the Clean Air Act.

NRC — National Response Center. A notification center in the Coast Guard Building in Washington, DC, with a toll-free number (**800/424-8802**) which must be called when significant oil or chemical spills or other environmentally related accidents occur.

Olfactory — Relating to the sense of smell. The olfactory organ in the nasal cavity is the sensing element that detects odors and transmits information to the brain through the olfactory nerves.

Operational Period — The period of time scheduled for execution of a given set of operational actions as specified in the Incident Action Plan.

Operations Coordination Center (OCC) — The primary facility of the Multi-agency Coordination System. It houses the staff and equipment necessary to perform the MACS functions.

Oral Toxicity — Adverse effects resulting from taking a substance into the body by ingestion

Oral — Used in or taken into the body through the mouth.

Organic Peroxide — An organic derivative of the inorganic compound hydrogen peroxide.

Orinasal Respirator — A respirator that covers the nose and mouth and generally consists of a quarter- or half-facepiece.

ORM — Other Regulated Materials. Materials that do not meet the definitions of hazardous materials, but posses enough hazardous characteristics that they require regulation.

Orthophoto Maps — Aerial photographs corrected to the scale such that geographic measurements may be taken directly from prints. They may contain graphically emphasized geographic features and may be provided with overlays of such features as water systems, important facility locations, etc.,

OSHA — Occupational Safety and Health Administration of the US Department of Labor, the federal agency with safety and health regulatory and enforcement authority for most US business and industry.

Out-Of-Service Resources — Resources assigned to an incident, unavailable for various reasons.

Overhead Personnel — Personnel assigned to supervisory positions including Incident Commander, command staff, general staff, directors, supervi-

sors and unit leaders.

Oxidation — In a literal sense, oxidation is a reaction in which a substance combines with oxygen, provided by an oxidizer or oxidizing agent. *(See definitions below).* In a broader sense, based on modern atomic theory, science today defines oxidation as a reaction — brought about by an oxidizing agent — in which atoms, molecules or ions lose electrons. In this broader sense, an oxidation reaction may occur even when oxygen is not present.

Oxidizer — DOT defines an oxidizer or oxidizing material as a substance which yields oxygen readily to stimulate the combustion (oxidation) of organic matter. Chlorate (ClO_3), permanganate (MnO_4) and nitrate (NO_3) compounds are examples of oxidizers; note that all contain oxygen (O).

Oxidizing Ability — The ability to yield oxygen readily to stimulate combustion.

Package Markings — The descriptive name, instructions, cautions, weight or specification marks required to be placed on the outside containers of hazardous materials.

Packaging — Any container that holds a material (hazardous or non-hazardous). Packaging includes non-bulk and bulk packaging.

PEL — Permissible Exposure Limit. An exposure limit established by OSHA. May be a time-weighted average (TWA) limit, or a maximum concentration exposure limit. *See also **Skin***.

Penetration — The movement of a material through a suit's closures, such as zippers, buttonholes, seams, flaps or other design features of chemical protective clothing, and through punctures, cuts and tears.

Percent Volatile — Percent Volatile by volume: the percentage of a liquid or solid (by volume) that will evaporate at an ambient temperature of 70° F (unless some other temperature is stated). Examples: butane, gasoline and paint thinner (mineral spirits) are 100 percent volatile; their evaporation rates vary, but over a period of time, each will evaporate completely.

Permeation — A chemical action involving the movement of chemicals on a molecular level, through intact material.

Permissible Exposure Limit — See "PEL."

Personal Protective Equipment — The equipment provided to shield or isolate a person from the chemical, physical and thermal hazards that may be encountered at a hazardous materials incident. Adequate personal protective equipment should protect the respiratory system, skin, eyes, face, hands, feet, head, body and hearing. Personal protective equipment includes both personal protective clothing and respiratory protection.

_p_H — Indication of the acidity or alkalinity of a substance. A _p_H from 1 to 7 is acidic and from 7 to 14, alkaline. A _p_H of 7 is neutral. Technically, _p_H is the logarithm of the reciprocal of the concentration of hydrogen ions in solution.

Piggyback Transport — A type of shipping in which bulk containers from one mode such as highway transportation are placed on flat cars or container-ships for transportation by another mode such as rail or marine.

Placards — 10-3/4" square diamond makers required on hazmat transporting vehicles — trucks, tank cars, freight containers 640 cu. ft or larger, etc.,

Planned or unplanned entry into an IDLH environment, an environment of unknown concentration of hazardous contaminant or an environment of unknown composition — A situation in which respiratory devices are recommended to provide adequate protection to workers entering an area where the contaminant concentration is above the IDLH or is unknown.

Planning Meeting — A meeting, held as needed throughout the duration of an incident, to select specific strategies and tactics for incident control operations and for service and support planning.

PMCC — Pensky-Martens Closed Cup — a flash point test method.

Poison, Class A — A gas or liquid so toxic that an extremely small amount of the gas or the vapor formed by the liquid is dangerous to life.

Poison, Class B — Less toxic liquids and solids that are hazardous either by contact with the body (skin absorption) or by ingestion.

Poison, Class C — Liquids or solids that evolve toxic or strongly irritating fumes when heated or when exposed to air (excluding Class A poisons).

Poisons, Class D — Radioactive materials.

Polar Solvents — Any flammable liquid that is miscible and destroys regular foam by mixing with the water in the foam.

Polymerization — A chemical reaction in which one or more small compounds combine to form larger compounds. A hazardous polymerization is such a reaction which takes place at a rate which releases large amounts of energy (usually heat). If hazardous polymerization can occur with a given material, the MSDS usually will list conditions which could start the reaction, and — since the material usually contains a polymerization inhibitor — the expected time period before the inhibitor is used up.

Potential Occupational

Carcinogen — Any substance, combination or mixture of substances which causes an increased incidence of benign and/or malignant neoplasms, or a decrease in the latency period between exposure and onset of neoplasms in humans or in one or more experimental mammalian species as a result of oral, respiratory or dermal exposure. This definition includes any substance that is metabolized into one or more potential occupational carcinogens by mammals (29CFR 1990.103, OSHA Cancer Policy).

ppb — Parts per billion. Unit for measurement of the concentration of a gas or vapor in air.

ppm — Parts per million. Unit for the measurement the concentration of gases, vapors and solids.

Pressure Vessel — A storage tank or vessel which has been designed to operate at pressures above 15psi.

Preventive Actions — Actions taken by the incident commander at an emergency to prevent the problem from increasing.

Protection Factors

Assigned protection factor (APF) — The minimum anticipated protection provided by a properly functioning respirator or class of respirators to a given percentage of properly fitted and trained users.

Simulated workplace protection factor (SWPF) — A surrogate measure of the workplace protection provided by a respirator.

Workplace protection factor (WPF) — A measure of the protection provided in the workplace by a properly functioning respirator when correctly worn and used.

Protective Clothing — Equipment designed to protect the wearer from heat and/or hazardous materials. Protective clothing is divided into three types: structural fire fighting protective clothing, chemical protective clothing, and high-temperature protective clothing.

psi — Pounds per square inch. For MSDS purposes, a unit for measuring the pressure a material exerts on the walls of a confining vessel or enclosure. For technical accuracy, pressure must be expressed as *psig* (pounds per square inch guage) or *psia* (pounds per square inch absolute — or guage pressure plus sea-level atmospheric pressure, or psig plus about 14.7 psi). *See also, "mm Hg."*

Pyrophoric Liquid — Any liquid capable of ignighting spontaneously when exposed to dry or moist air.

Radio Cache — A cache may consist of a number of portable radios, a base station, and — in some cases — a repeater, stored in a predetermined location for dispatch to incidents.

Radioactive Material (RAM) — Any material that spontaneously emits ionizing radiation.

RCRA — Resource Conservation and Recovery Act**.** Federal environmental legislation administered by the EPA, aimed at controlling the generation, treatment, storage, transportation and disposal of hazardous waste.

Reaction — A chemical transformation or change. The interaction of two or more substances to form new substances.

Reactivity — A description of the tendency of a substance to undergo chemical reaction (usually with the release of energy). Undesirable effects such as pressure buildup, temperature increase, and formation of noxious toxic or corrosive products may occur because of the reactivity of a substance by heating, burning, direct contact with other materials or other conditions of use or storage. A solid waste which exhibits a "characteristic of reactivity" as defined by RCRA may be regulated by the EPA as a hazardous waste.

Recommended Exposure Llimit — See "REL".

Reducing Agent — In a reduction reaction (which always occurs simultaneously with an oxidation reaction) the reducing agent is the chemical or substance which combines with oxygen, or which loses electrons in the reaction. *See, also, "oxidation."*

Refinery — A place where crude materials are purified.

Reinforced Attack — Those resources requested in addition to an initial attack.

REL — Recommended exposure limit. An 8- or 10-hour, time-weighted average (TWA) or ceiling (C) exposure concentration recommended by NIOSH, that is based on an evaluation of health effects data.

Reporting Locations — Any of six facilities or locations where incident assigned resources may check in. The locations are: *Incident Command Post Resources Unit (RESTAT)*; *base*; *camp*; *staging area*; *helibase*; and *division supervisor* - for direct line assignments. (Check-in is at one location only).

Rescue Medical — Any manned ground vehicle capable of providing emergency medical services.

Resources — All of the immediate or supportive assistance available to help control an incident, including personnel equipment, control agents, agencies and printed emergency guides.

Respiratory Protection — Equipment designed to protect the wearer from the inhalation of contaminants. Respiratory protection is divided into three types: *positive pressure self-contained breathing apparatus*; *positive pressure supplied-air respirators*; and *air purifying respirators.*

Respiratory System — The body's breathing system, including the lungs, trachea, mouth and nose, and the associated nervous and circulatory

supply systems.

Response — That portion of an incident management in which personnel are involved in controlling a hazardous materials incident.

RESTAT — An acronym for resource unit — a unit within the planning section.

Rupture Disk — A safety relief device in the form of a metal disk that closes the relief channel under normal conditions. The disk bursts at a set pressure to permit the escape of gas.

Safety Relief Valve — A device found on pressure cargo tanks containing an operating part that is held in place by spring force. Valves open and close at set pressures.

Section — That organization level having funtional responsibility for primary segments of incident operations such as operations, planning, logistics, finance. The section-level is organizationally between branch- and incident-commander.

Sensitizer — A substance which, on first exposure, causes little or no reaction in humans but which, on repeat exposure, may cause a marked response not necessarily limited to the contact site. Skin sensitization is the most common form of sensitization in the industrial setting, although respiratory sensitization to a few chemicals is also known to occur.

SETA — Setaflash Closed Tester — a flash point test method.

Service Life — The length of time for an air-purifying element to reach a specific effluent concentration. Service life is determined by the type of substance being removed, the concentration of the substance, the ambient temperature, the specific element being tested (cartridge or canister), the flow rate resistance and the selected breakthrough value. The service life for a self-contained breathing apparatus (SCBA) is the period of time, as determined by the NIOSH certification tests, in which adequate breathing gas is supplied.

Sheer Section — A safety feature incorporated into cargo tank piping and fittings designed to fail or break completely to prevent damage to shut-off valves or the tank itself.

Shipping Papers — A shipping order, bill of lading, manifest, or other shipping documents issued by the carrier.

Single-Use Dust — Respirators approved for use against dusts or mists that may cause pneumoconiosis and fibrosis.

Skin — A notation, sometimes used with PEL or TLV exposure limit information, indicating that the stated substances may be absorbed by the skin, mucous membranes and eyes when they are either airborne or by direct contact with them, and that this additional exposure route must be considered in evaluating the exposure of an individual.

Skin Sensitizer — see S*ensitizer*.

Skin Toxicity — See *Dermal toxicity*.

Slopover — An expulsion of oil and froth from the surface of a tank, produced when water or foam is applied to a burning liquid surface.

Solubility — A measure of the amount of a substance that will dissolve in another substance.

Solubility In Water — A term expressing the percentage of a material — by weight — that will dissolve in water at ambient temperature. Solubility information can be useful in determining spill cleanup methods and fire extinguishing methods for a material. Terms used to express solubility are: *negligible* (less than 0.1 percent), *slight* (0.1 to 1.0 percent), *moderate* (1 to 10 percent), *appreciable (more than 10 percent)*, and *soluble in all proportions*.

SO_X — Oxides of sulphur. SO_X pollutant emissions are regulated by EPA under the Clean Air Act.

Span-Of-Control — The supervisory ratio of from three to seven individuals with five being established as a general rule of thumb.

Species — A biological type. On MSDAs, "species" refers to the test animals — usually rats, mice or rabbits — which were used to obtain the results of toxicity test data.

Specific Gravity — The ratio of the density of a substance to the density of a reference substance; it is an abstract number that is unrelated to any units. For solids and liquids, specific gravity is numerically equal to density, but for gases it is not, because of the difference between the density of the reference substances, which are usually water (1g/cc) for solids and liquids and air (0.00129 g/cc, or 1.29 g/L at 0C and 760 mm Hg) for gases.

Spontaneous Combustion — The process of increase in temperature of a material to a point of ignition without drawing heat from its surroundings.

Stability — An expression of the ability of a material to remain unchanged. For MSDS purposes, a material is stable if it remains in the same form under expected and reasonable conditions of storage or use.

Stabilization — The stage of an incident when the immediate problem or emergency has been controlled, contained or extiguished.

Stage of Incident — One of five definite and identifiable phases through which an emergency passes from onset (interruption of normal conditions) to stabilization.

Staging Area — That location where incident personnel and equipment are assigned. It is expected that personnel and equipment at the staging-area must be available within three-minutes to enter the incident-area.

Standard Transportation Commodity Code (STCC number) — A listing of code numbers for categories of articles being shipped, in general use by carriers.

STEL — Short-Term Exposure Limit.

Stress — A state of tension put on a shipping container by internal chemical action, external mechanical damage or external flames or heat.

Strike Team — Specified combinations of the same kind and type of resources, with common communications and a common leader.

Structural Firefighters Protective Clothing — Clothing that will prevent gases, vapors, liquids and solids from coming in contact with the skin. This equipment includes helmet, scba, coat and pants, rubber boots, gloves, bands around the legs, arms, waist and face mask, and covering for neck, ears, and all parts of the head not covered by the helmet or the scba or the face mask.

Subsurface Injection — Discharge of foam or water into a storage tank from an outlet at the tank.

Teratogenisis — Alteration in the formation of cells, tissues, and organs, resulting from physiologic and biochemical changes in a fetus during growth.

TLV-C — The ceiling exposure limit - the concentration that should not be exceeded even instantaneously.

TOC — TAG Open Cup, a flash point test method.

Toxic Materials — Substances which can be poisonous if inhaled, swallowed or absorbed into the body through cuts or breaks in the skin.

Toxicity — The sum of adverse effects resulting from exposure to a material, generally by ingestion, absorption through the skin or inhalation.

Tractor Plow — Any tracked vehicle with a plow for exposing mineral soil, with transportation and operating personnel.

Trade Name — The trademark name or commercial name for a material.

TSCA — Toxic Substances Control Act. Federal environmental legislation administered by the EPA which regulates the manufacture, handling and use of materials calssified as *toxic substances.*

TWA — Time Weighted Average. With reference to exposure, TWA is the airborne concentration of a material to which a person is exposed, averaged over the total exposure time (generally the total work day of 8 to 12 hours).

UEL — Upper Explosive Limit. (Also known as *UFL* or *Upper Flammable Limit*). The highest concentration of a vapor or gas that

	will produce a flash of fire when an ignition source is present. At higher concentrations than the UEL, the mixture is too rich to burn.
UFL	See *UEL*.
Unified Command	A method for all agencies or individuals who have jurisdictional responsibility, and in some cases who have functional responsibility at an incident, to contribute to determining overall objectives for the incident and the selection of strategy to achieve those objectives.
Unit	That organizational element with functional responsibility for a specific incident planning, logistic or finance activity.
Unstable	Tending toward decomposition or other unwanted chemical change during normal handling and/or storage.
Unstable Materials	Substances capable of rapidly undergoing chemical changes or decomposition.
USDA	US Department of Agriculture.
Vapor	Gas given off, with or without the aid of heat, by substances that under normal circumstances are either solid or liquid.
Vapor Density	The weight of a vapor or gas compared to the weight of an equal volume of air, or an expression of the density of the vapor or gas. Materials lighter than air have a vapor density of less than 1.0 (e.g., acetylene, methane, hydrogen). Materials heavier than air have a vapor density of more than 1.0 (e.g., carbon dioxide, propane, hydrogen sulfide, ethane, butane, chlorine, sulfur dioxide).
Vapor Pressure	The pressure exerted by the vaporization of a liquid in a closed container. When pressure vapor tests are performed on products, the test temperature is usually 68°F to 100°F and the vapor pressure is expressed as pounds per square inch (*psig* or *psid*). Vapor pressures reported on MSDSs are calculated in millimeters of mercury (*mm Hg*) at 68°F (20°C) unless otherwise stated. · The vapor pressure of a substance at 100°F will always be higher than the vapor pressure of a substance at 68°F · Vapor pressures reported on MSDSs in mm Hg are usually very low pressures. 760 mm Hg is equivalent to 14.7 psi · The lower the boiling point of a substance the higher its vapor pressure.
Vapor Space	Space left empty inside a tank containing liquefied gas to allow for expansion of the gas due to normal changes in temperature.
Vaporization	The process of changing from liquid to vapor.
Ventilation	See *general exhaust*, *local exhaust* and *mechanical ventilation*.
Viscosity	The flow resistance of a liquid. This characteristic increases and decreases with the temperature of the liquid. Low-viscosity liquids have little adhesive qualities and hence flow freely.
Warm Zone	Area where personnel and equipment decontamination and hot-zone support takes place. It includes control points for the access corridor and thus assists in reducing the spread of contamination. This is also referred to as the decontamination-, contamination reduction- or limited access-zone/corridor.

Water Solubility — The ability of a liquid or solid to mix with or dissolve in water.

Water-Reactive — Substances, generally flammable solids, that will react in varying degrees when mixed with water or when they come in contact with humid air.

Waybill — The shipping paper prepared by the railroad from a bill of lading. Waybills generally accompany a shipment and are carried by the conductor in the caboose of a train.

Weak Seam — In oil tanks, a special roof-to-shell seam attachment that is designed to give under overpressure and release vapor from the vapor space.

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