

Hazardous Materials Awareness

Student Manual

Haz Mat and Homeland Security
01-09-0027 (Rev. 1/13)



**Homeland Security
and Emergency Services**

**Fire Prevention
and Control**

UNIT ONE

Lesson Objectives

At the end of this lesson the participants will be able to:

- 1. When given a scenario, identify the levels of response and the appropriate training responsibilities for each response.**
- 2. Identify the appropriate level of emergency response activity for each level of hazardous materials training.**

1/2013

INTRODUCTION

Emergency response personnel carrying out their normal duties may very well discover, come upon, or respond to an incident involving hazardous materials. In many instances the activity may seem routine, may be dispatched as a routine incident, new information is gained after your arrival. A police officer on routine patrol may discover an illegally dumped container of an unknown material or an ambulance crew may be dispatched to a call for a person having difficulty in breathing and upon arrival find an exposure to a hazardous material. Firefighters are especially vulnerable to an exposure to hazardous materials.

New York State has passed legislation offering the same level of worker protection to Public Sector workers (police, fire, ems, public works, and others) that is afforded to private sector workers under the regulations established by the Federal Occupational Safety and Health Administration. These regulations are often referred to as the OSHA regulations. Hazardous Materials is covered under standard 1910.120 titled “Hazardous Waste Sites and Emergency Response” Paragraph (q) of the document specifically establishes the requirements for the emergency mode of an incident involving hazardous materials. Paragraph (q) (1) requires each employer to develop an emergency response plan specifically for their agency. This plan will identify the activities that their employees will perform at a hazardous materials incident. The choices range from an Awareness Level activity through the Incident Command Level.

This training material is designed to cover the training and education requirements as identified in OSHA 1910.120 (q) (6) (i) titled “First Responder Awareness Level” and Chapter 2 of the National Fire Protection Association (NFPA) 472 standard titled “Competencies of Responders to Hazardous Materials Incidents for the First Responder Awareness Level”. Both documents address the training or educational requirements needed to successfully operate at the Awareness Level. In addition to the training material covered in this program you will need to be familiar with your employer’s emergency response plan and your role as defined in that plan.

LEVELS OF RESPONSE

There are five operational levels for an incident involving hazardous materials defined in OSHA 1910.120 titled Hazardous Waste and Emergency Response. In addition there are specific requirements identified in section (q) (3) that the Incident Commander must follow.

The first level of emergency response is identified in the Awareness Level. While there are specific competencies listed there are no specific hours required to complete the training to react appropriately for each of those competencies. The awareness level person may witness, discover, or come upon an incident involving a hazardous material. They are trained to take no further action to deal with the material, but are trained to initiate an emergency response from persons trained at the operations level or higher.

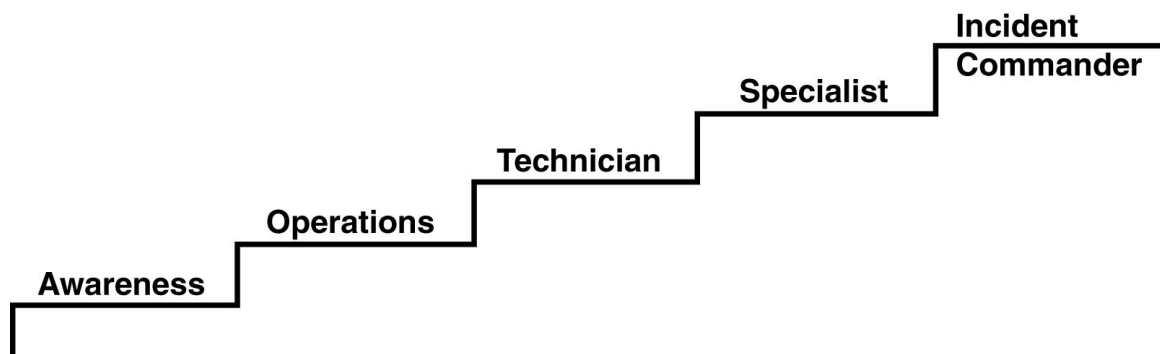
The employer's emergency response plan will identify the level of participation for their employees which will then need to match the training for those individuals. As rule police officers, public works, and emergency medical service personnel would be required to meet the awareness level training requirements.

The second level is the First Responder Operations Level which requires a minimum of 8 hours of training which must also include the competencies of the First Responder Awareness Level person. This person is expected to respond to an incident involving hazardous materials, such as firefighters. They typically respond to releases or potential releases to protect nearby persons, property, or the environment. They work in a defensive manner to keep the product from spreading without trying to stop the leak unless it can be controlled from a remote shut off.

The third level is the Hazardous Materials Technician level which requires a minimum of 24 hours of training which will include the competencies of the First Responder Operations Level responder. This person wears special protective equipment and enters the contamination (hot) zone to stop the leak, contain the spill, or make appropriate rescues. This person may be part of an organized hazardous materials team or may work independently with other technicians.

The fourth level is the Hazardous Materials Specialist which requires the same level of training as the Hazardous Materials Technician. In addition this person is expected to have a special knowledge, skill, or ability to assist the hazardous materials technician. As an example the specialist may have special knowledge of the container, the product, or the complexity of the situation.

The fifth level is the Incident Commander. The Incident Commander must have 24 hours of training which must also include that of the First Responder Operations Level. OSHA identifies the Incident Commander as "the senior official at an emergency who has the responsibility for controlling the operations at the site. Initially it may be the senior officer on the first-due piece of emergency apparatus to arrive on the incident scene. As more senior officers arrive (i.e battalion chief, fire chief, state law enforcement official, site coordinator, etc.) the position is passed up the line of authority which has been previously established".



ACTIVITY 1

Small Group Activity

30 minutes

Purpose: The purpose of this activity is to utilize a scenario to identify the appropriate levels of emergency response to an incident involving gasoline.

Directions:

1. Read the scenario.
2. While working in small groups answer the questions regarding the incident and the role, as portrayed, for the various responders
3. Select a spokesperson for your group to report your group's answers to the questions.

Summary: It is critical that responders read the appropriate clues from an incident involving hazardous materials and take appropriate actions within their level of training and personal protective equipment as identified in OSHA 1910.120.

ACTIVITY 1 SCENARIO

A police officer on routine patrol is dispatched to an auto accident involving a truck and a passenger vehicle. The officer is familiar with the location as he has investigated several accidents at this intersection. The intersection of State Highway 79 and Doolittle Road is located at the crest of a hill with a gradual slope from the intersection in all four directions.

The police officer arrives to find an aluminum tanker truck marked Jerry's Gasoline Company lying on its side. The trailer has placards on the end that are red and read "1203". The driver of the truck is moving in the overturned cab and appears dazed and confused. A 12 passenger van with approximately 6 senior citizens appear to have minor injuries and are off the road about 100 feet from the tanker on the other side of the road. The police officer asks dispatch to notify the fire department for a hazardous materials response with extrication and about 7 victims that need medical treatment. She also asks for two more police officers to assist with traffic control.

Engine 3 is the first to arrive with one Captain and three firefighters aboard. Engine 5 and Rescue 1 will arrive in two minutes with another 4 firefighters and 1 officer each. Chief 1 is about 10 minutes away. The fire departments two ambulances are in route and two additional ambulances have been requested under mutual aid. The County Hazardous Materials Response Team has been summoned.

Engine 3 officer performs a size-up and notes a MC306 12,000 tanker, leak from a dome cover, product that smells like gasoline, placards marked 1203, and the name of a gasoline company on the truck.

Engine 3 officer directs two firefighters to place a foam blanket on the leaking gasoline from a distance, two firefighters from Engine 5 to place a back-up line in position to protect the foam crew and the cab of the truck. Rescue 1 is directed to provide extrication of the driver and triage the passengers of the van. Two members of Engine 5 are directed to dig a small diversion ditch from a safe location to a low area for the leaking product to pool. The HazMat team is directed to stop the leak at the dome cover and the incident is stabilized in 30 minutes. During the mitigation efforts the HazMat team recovers the shipping papers which indicate the load was 12,000 gallons of unleaded gasoline.

All firefighters and Hazardous Materials Team members wore full personal protective equipment, including self-contained breathing apparatus while performing activities at or near the tanker.

ACTIVITY 1 QUESTIONS

1. What clues are presented that may indicate a hazardous materials incident may be involved with this accident?
2. What risks or hazards could the emergency responders face from this incident and potential materials involved.
3. What level was the police officer performing her duties at? What level of training would be required for this level of activity?
4. Who was the initial Incident Commander? What level of training would be required for this level of activity?
5. What level of activity was the firefighters manning the foam line and back-up line performing? What level of training would be required for this level of activity?
6. What level of activity were the two firefighters assigned to dig a diversion ditch, from a safe area?
7. What level of Activity was the Hazardous Materials team performing? What level of training would be required for this level of activity?

8. What other position within the command structure would the Incident Commander be required to initiate?
9. What could be the potential outcome if no Hazardous Materials team was available to tighten the dome cover?
10. What could be the outcome if the gasoline vapors found an ignition source?
11. What could be the outcome from an exposure to the vapors if the responders did not wear protective clothing and self-contained breathing apparatus?

**STATE OF NEW YORK
OFFICE OF FIRE PREVENTION AND CONTROL**

HAZARDOUS MATERIALS FIRST RESPONDER AWARENESS

UNIT TWO

Lesson Objectives

At the end of this lesson the participants will be able to:

- 1. Identify the nine classes of hazardous materials as identified by the US Department of Transportation and give one example of each classification**
- 2. Identify the typical containers used to transport hazardous materials.**

INTRODUCTION

A commonly accepted method of hazardous materials classification is that used by the US Department of Transportation. This system utilizes nine different classes of materials with one of the nine being the primary threat to people or the environment. Since the characteristics of the materials do not change once the product leaves the transportation mode the containers will need to be similar, handling procedures will need to be similar, and the hazards will be the same.

The Department of Transportation reviews each material to determine its characteristics such as the pressure that will be in the container, its flammability, if it is corrosive, will spontaneously ignite, or other features that require special considerations. The results of the review of the material will result in several considerations such as the following:

- Appropriate Container
- Placards or labels
- Appropriate hazard class
- Secondary hazard class called “subsidiary hazard”
- If it is safe to ship
- Assignment of a four digit United Nations number
 - Note: Many products can have the same number due to similar characteristics
 - Example: Cosmetics - UN 1993
 - Diesel Fuel - UN 1993
- Any materials it may be incompatible with
 - Example: Poisons and food products

MARKING AND IDENTIFICATION FOR TRANSPORTATION

After a hazardous materials has been evaluated for its hazards and characteristics it is placed into a classification and if appropriate, a subdivision of the classification. As an example, explosives, which as Class 1 materials, has six different subdivisions? Dynamite is classed differently than ammunition or blasting agent.

All hazardous materials not carried in bulk containers (tank trucks) require an appropriate label on the package or container. The label will be reflective of the hazard class assigned to that material.

Some materials because of their hazard require a placard on the transportation vehicle regardless of the amount being shipped. Materials such as Explosives 1.1 (dynamite) and Dangerous When Wet (Calcium Carbide) require a placard if the vehicle is carrying as little as one pound of the material. Most materials will not require a placard until the weight of the material reaches 1,001 pounds such as explosives 1.4 (explosive rivets) or flammable solid (highway flares).

Mixed loads of materials that require a placard after 1,001 pounds of weight can be placarded by placards from each material classification or a “DANGEROUS” placard can be displayed. A dangerous placard indicates a mixed load of hazardous materials aboard. An exception to the mixed load rule is that if more than 2,205 pounds of the same material are loaded at one facility that material must have its own placard in addition to the Dangerous placard for the remaining mixed load.

Bulk containers carrying flammable or combustible liquids, such as tank truck, have two options to identify the fact that the material is either flammable or combustible and then identify the product by displaying the four digit United Nations number for that product. One option is to display a flammable or combustible placard with an additional orange panel displaying the four digit United Nations number. The second option is to display a flammable or combustible placard with a second placard displaying the United Nations number displayed in the center of the placard.

Some materials pose more than one risk and require a second placard indicating that danger. This is done with a second placard that does not display the hazard class number at the bottom of the placard. As an example a vehicle may display a flammable liquid placard with the flame at the top, the word Flammable in the middle, and a 3 at the bottom indicating a hazard class 3. The second or subsidiary placard may be an Inhalation Hazard placard that has the skull and crossbones at the top, the words Inhalation Hazard in the middle, and no number at the bottom. This would indicate that the primary hazard of the product is flammability and the second hazard is an inhalation hazard.

CLASSIFICATION OF MATERIALS

A material that poses a hazard to people, buildings, or the environment generally poses multiple risks. As an example spilled gasoline could pose a risk from fire, could cause an explosion if the material is allowed to vaporize and the ignition is delayed, or it may cause an inhalation hazard if it occupies a closed area and excludes the oxygen from the area.

Primary hazards from injury or damage from a hazardous material generally results in dangers in six areas. Responders typically use the acronym TRACEMP to identify those danger areas.

- Thermal – burns from heat or cold
- Radiation – body tissue or organ damage from exposure to radioactive materials
- Asphyxiation – vapors or gases replace the oxygen in a given area which most often happens in a confined space
- Chemical – may cause injuries from being corrosive or cause other materials to react in a hazardous manner

- Etiological – causes injuries from bacterial exposure through inhalation, ingestion, or absorption through the skin and mucus membrane. Biological hazards also fall into this category.
- Mechanical – causes harm from explosions, blast wave, flying shrapnel, or containers themselves being propelled at a high rate of speed.
- Psychological – when exposed to traumatic or disaster, some responders may suffer immediate, short-term or long-term psychological stress.

Hazardous materials are assigned to one of nine classifications. Some classifications are also subdivided into specific divisions. At an incident involving a hazardous material it is important for the first responder to consider the dangers of the materials present. One easy way is to identify the appropriate hazard class and then evaluate the TRACEMP factors for that class of material.

Nine classifications of materials:

Class 1 – Explosives

Division 1.1 Explosives with a mass explosion hazard

Example: Dynamite

Division 1.2 Explosives with a projection hazard

Example: Fragmentation bomb

Division 1.3 Explosive with predominantly a fire hazard

Example: Some fireworks
Flash powders

Division 1.4 Explosives with no significant blast hazard

Example: Detonating cord
Explosive rivets

Division 1.5 Very insensitive explosives not likely to explode during transit

Example: Blasting agent (prilled ammonium nitrate and fuel oil)

Division 1.6 Extremely insensitive detonating articles

Note: No materials classified as 1.6 by US DOT

Class 2 – Gases

Division 2.1 Flammable gases

Example: Acetylene

Division 2.2 Non-flammable, non-toxic (poisonous) compressed gases

Example: Oxygen

Division 2.3 Gases toxic by inhalation

Example: Chlorine

Division 2.4 Corrosive gases – used only in Canada

Class 3 – Flammable and Combustible Liquid

While there are no additional divisions, the distinction of a liquid being flammable is if its flash point is 100 degrees F or lower. Materials with a flash point above 100 degrees are classed as a combustible liquid.

There are additional classifications used by other agencies which are dependant upon the flash point as well.

Class 4 – Flammable Solids, Spontaneously Combustible Materials, or Dangerous When Wet

Division 4.1 Flammable solids

Example: Highway flares

Division 4.2 Spontaneously Combustible Materials

Example: Molten White Phosphorus

Division 4.3 Dangerous When Wet

Example: Calcium Carbide

Class 5 – Oxidizers and Organic Peroxides

Division 5.1 Oxidizers

Example: Ammonium Nitrate Fertilizer

Division 5.2 Organic Peroxides

Example: Organic Peroxide – liquid or solid

Class 6 - Toxic Materials and Infectious Substances

Note: Toxic and poison are synonymous

Division 6.1 Toxic Materials

Example: Hydrogen Cyanide

Division 6.2 Infectious Substances

Example: Regulated Medical Waste

Class 7 – Radioactive materials (no subdivisions)

Example: Uranium metal

Class 8 – Corrosive Materials (no subdivisions)

Example: Sulfuric Acid

Class 9 – Miscellaneous Dangerous Goods

Division 9.1 Miscellaneous dangerous goods

Division 9.2 Environmentally Hazardous Substances

Division 9.3 Dangerous Wastes

Note: Canada requires Divisions 9.1, 9.2, and 9.3 while the United States does not use subdivisions for Class 9 materials

Example: Hazardous Waste – Solid or Liquid

ACTIVITY 2

Small Group Activity
30 minutes

Purpose: The purpose of this activity is to reinforce the main points of the United States Department of Transportation classification system for hazardous materials and to identify the types of harm that may occur from an exposure to the material.

Directions:

1. Work in small groups.
2. Using the activity worksheet, identify both the US Department of Transportation hazard classification for the materials listed and at least what the primary hazard from the material may be.

Example:

Material	Classification	TRACEMP
Calcium Carbide	4 – (Dangerous When Wet)	Thermal – (flammability as it produces acetylene gas)

3. Record your answers on the activity worksheet
4. Select a spokesperson to report the results of your activity.

ACTIVITY 2 WORKSHEET

MATERIAL	CLASSIFICATION	TRACEMP
Sulfuric Acid	_____	_____
Gasoline	_____	_____
Dynamite	_____	_____
Uranium	_____	_____
Propane Gas	_____	_____
Blasting Agent	_____	_____
Oxygen	_____	_____
Diesel Fuel	_____	_____
Hydrocyanic Acid	_____	_____
Matches	_____	_____

**STATE OF NEW YORK
OFFICE OF FIRE PREVENTION AND CONTROL**

HAZARDOUS MATERIALS FIRST RESPONDER AWARENESS

UNIT THREE

Lesson Objectives

At the end of this lesson the participants will be able to:

- 1. Determine an appropriate guide page to utilize for a specific material.**
- 2. Demonstrate the process to identify a material by its name or by its four digit identification number.**
- 3. Demonstrate the ability to determine isolation distances for specific materials.**

INTRODUCTION

Every three or four years the United States Department of Transportation publishes a revised Emergency Response Guidebook. The book covers in excess of 30,000 hazardous materials offered for shipment. The guidebook lists over 2,200 materials by name and by a four digit United Nations product identification number. In order to cover the 30,000 materials with only 2,200 product listings the same number and product classification is used. As an example there are several variations of gasoline. The same four digit number (1203) and product name (gasoline) is used for all variations of gasoline. Other products are often listed as a product name followed by a designation of n.o.s. which represents NOT OTHERWISE SPECIFIED. As an example Flammable Solid, Corrosive n.o.s. UN #2925 may be used for hundreds of materials that fall within the parameters established for that material. As a responder the critical aspect is regardless of the material assigned that number they will all react the same, require the same evacuation or isolation distances, and require the same level of protective clothing to approach the material.

The guidebook has a variety of features that make it easy for responders to obtain pertinent and critical information about the material. The material can be identified by its common name (Gasoline), by a four digit United Nations number (UN #1203), and the appropriate guide page to consult for emergency response information (#128). On the guide page will be information about isolation or evacuation such isolate spill or leak immediately at least 150 feet in all directions. In addition other information may be included for large containers such as tank cars or trailer loads such as isolate ½ mile in all directions. In some instances the guide page information will provide an isolation distances for small spills, leaks or fires and a separate isolation recommendation for a large spill, leak, or fire. Gasoline as an example recommends 150 feet isolation immediately, 1,000 feet for large spills, and ½ mile if it is a tank car or truck involved in fire.

UNITED STATES DEPARTMENT OF TRANSPORTATION EMERGENCY RESPONSE GUIDEBOOK

The Emergency Response Guidebook not only provides specific emergency response information about hazardous materials; it also provides additional information as well. On the inside cover of the document it provides an example of a shipping paper for a hazardous material. The shipping paper is carried with the transportation vehicle carrying the material. In a highway transport it would be with the driver. With a train it would be with the engineer in the engine. With a ship it would be in the wheelhouse and with a barge it would be located in a mailbox about in the middle of the ship.

The shipping paper will identify several critical emergency response factors such as:

- Emergency contact number where emergency response information can be obtained.
- Number of packages in the shipment or the container.
- Description of the material or article.
- Hazard class number.
- UN product identification number.

- Packaging group (three groups possible - I, II, III)
- Quantity (may be by weight).

SHIPPING DOCUMENTS (PAPERS)

Shipping Documents (Papers) are synonymous and can be found as follows:

- Road – kept in the cab of a motor vehicle
- Rail – kept in possession of a crew member
- Aviation – kept in possession of the aircraft pilot
- Marine – kept in a holder on the bridge of a vessel

Shipping Documents (Papers) provide vital information regarding the hazardous materials/dangerous goods to initiate protective actions*

Information provided:

- 4-Digit **Identification** Number, UN or NA (go to Yellow Pages) **
- Proper Shipping name (go to Blue Pages)
- Hazard Class or Division number of material
- Packing Group
- Emergency Response Telephone Number
- Information describing the hazards of the material (entered on or attached to shipping document)

EMERGENCY CONTACT 1-000-000-0000		EXAMPLE OF EMERGENCY CONTACT TELEPHONE NUMBER	
		HAZARD CLASS OR DIVISION NO.	
NO. & TYPE OF PACKAGES		QUANTITY	
1 TANKTRUCK	UN1219	ISOPROPANOL 3	II 12 000 LITERS
ID NUMBER		SHIPPING NAME	PACKING GROUP

EXAMPLE OF PLACARD AND PANEL WITH ID NUMBER

The 4-digit ID Number may be shown on the diamond-shaped placard or on an adjacent orange panel displayed on the ends and sides of a cargo tank, vehicle or rail car.



* For the purposes of this guidebook, the terms hazardous materials/dangerous goods are synonymous.

** After January 1, 2013 in the United States, the **identification** number **must** appear **first** in the basic description. For example, "UN2744, Cyclobutyl chloroformate, 6.1, (3, 8), PG II". This is currently optional in Canada.

An important consideration for isolation or evacuation is the toxic dangers from a material. If a material is a very strong poison as responders we need to keep a safe distance. Materials that produce such a toxic or poisonous vapor are said to be toxic by inhalation which is often identified as TIH. Testing for the level of toxicity is typically done with laboratory animals and then a comparison is made to human beings. The test results are expressed as a Lethal Concentration to 50% of the test audience or a LC50 at a given level of exposure which is typically expressed as a concentration in parts per million, or PPM. For the purpose of the first responder this information is expressed in

the ERG as a Hazard Zone. In the ERG several materials will be designated with a Hazard Zone A, B, C, or D. As a point of reference 1 part per million (ppm) is equivalent to 1" in 16 miles. It is prudent to remember that it takes a lot less of the material in Hazard Zone "A" to injure a person than it does in Hazard Zone "D". The values for each zone are follows:

Hazard Zone A = LC 50 of less than or equal to 200ppm

Hazard Zone B = LC50 greater than 200ppm and less than or equal to 1, 000ppm

Hazard Zone C = LC50 greater than 1,000ppm and less than or equal to 3,000ppm

Hazard Zone D = LC50 greater than 3,000ppm and less than or equal to 5,000ppm

Liquefied gas, poisonous, flammable, corrosive, n.o.s. (Inhalation Hazard Zone A)	119	3309	Liquefied gas, poisonous, n.o.s. (Inhalation Hazard Zone C)	123	3162
Liquefied gas, poisonous, flammable, corrosive, n.o.s. (Inhalation Hazard Zone B)	119	3309	Liquefied gas, poisonous, n.o.s. (Inhalation Hazard Zone D)	123	1955
Liquefied gas, poisonous, flammable, corrosive, n.o.s. (Inhalation Hazard Zone C)	119	3309	Liquefied gas, poisonous, n.o.s. (Inhalation Hazard Zone D)	123	3162
Liquefied gas, poisonous, flammable, corrosive, n.o.s. (Inhalation Hazard Zone D)	119	3309	Liquefied gas, poisonous, oxidizing, corrosive, n.o.s.	124	3310
Liquefied gas, poisonous, flammable, corrosive, n.o.s. (Inhalation Hazard Zone D)	119	3309	Liquefied gas, poisonous, oxidizing, corrosive, n.o.s. (Inhalation Hazard Zone A)	124	3310
Liquefied gas, poisonous, flammable, n.o.s.	119	3160	Liquefied gas, poisonous, oxidizing, corrosive, n.o.s. (Inhalation Hazard Zone B)	124	3310
Liquefied gas, poisonous, flammable, n.o.s. (Inhalation Hazard Zone A)	119	3160	Liquefied gas, poisonous, oxidizing, corrosive, n.o.s. (Inhalation Hazard Zone C)	124	3310
Liquefied gas, poisonous, flammable, n.o.s. (Inhalation Hazard Zone B)	119	3160	Liquefied gas, poisonous, oxidizing, corrosive, n.o.s. (Inhalation Hazard Zone D)	124	3310
Liquefied gas, poisonous, flammable, n.o.s. (Inhalation Hazard Zone C)	119	3160	Liquefied gas, poisonous, oxidizing, n.o.s.	124	3307

Safety precautions in many instances are common sense measures of protection. An expression of time, distance, and shielding has been used for many years when referring to the dangers from radioactive materials. That same principle is appropriate for any hazardous material.

Time: Minimize the amount of time you are exposed to any hazardous material.

Distance: Keep as far away as possible – outside the area where harm can occur.

Shielding: Put any object that can provide shielding between you and the material.

Some general safety precautions for emergency responders include the following:

- Approach the scene cautiously from upwind (wind to your back as you approach the incident scene)
- Secure the scene so others do not become victims or exposed
- Identify the hazards present – remember the nine classes of materials and TRACEMP
- Assess the situation carefully
- Obtain help immediately

- Decide if it is safe to enter the area or site where the materials may be.
- Respond carefully – avoid tunnel vision
- Do not walk in the material, touch the material, inhale the material, or otherwise come in contact with the material.

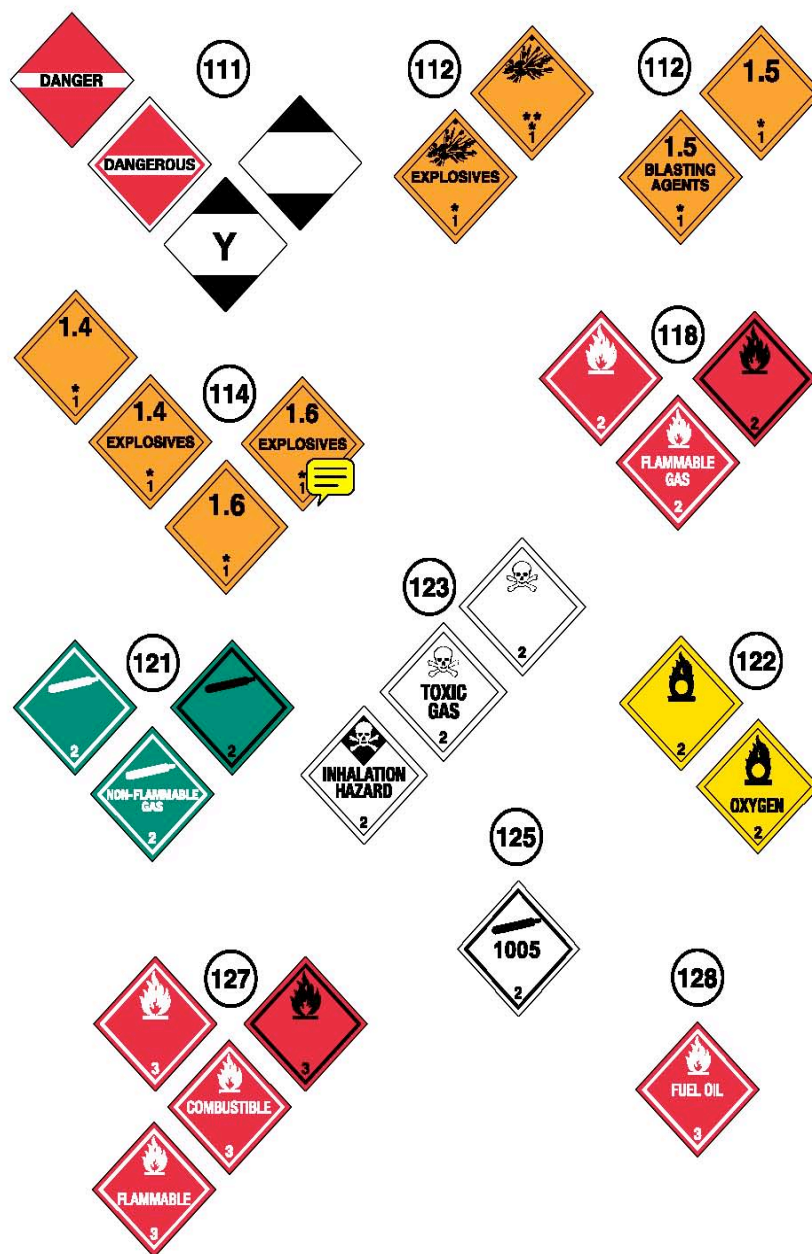
The Emergency Response Guidebook provides an identification page for placards or labels. If you observe a label or placard and are unsure of the material utilize the guide to match up the placard with those in the book and go to the appropriate guide page that is listed in the circle next to the placard. As an example if you come upon an incident and a vehicle has a dangerous placard you would utilize guide page 111.

GUIDE 111	MIXED LOAD/UNIDENTIFIED CARGO	ERG2012
POTENTIAL HAZARDS		
FIRE OR EXPLOSION <ul style="list-style-type: none"> • May explode from heat, shock, friction or contamination. • May react violently or explosively on contact with air, water or foam. • May be ignited by heat, sparks or flames. • Vapors may travel to source of ignition and flash back. • Containers may explode when heated. • Ruptured cylinders may rocket. 		
HEALTH <ul style="list-style-type: none"> • Inhalation, ingestion or contact with substance may cause severe injury, infection, disease or death. • High concentration of gas may cause asphyxiation without warning. • Contact may cause burns to skin and eyes. • Fire or contact with water may produce irritating, toxic and/or corrosive gases. • Runoff from fire control may cause pollution. 		
PUBLIC SAFETY		
<ul style="list-style-type: none"> • CALL EMERGENCY RESPONSE Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover. • As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions. • Keep unauthorized personnel away. • Stay upwind. • Keep out of low areas. 		
PROTECTIVE CLOTHING <ul style="list-style-type: none"> • Wear positive pressure self-contained breathing apparatus (SCBA). • Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. 		
EVACUATION		
Fire <ul style="list-style-type: none"> • If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. 		

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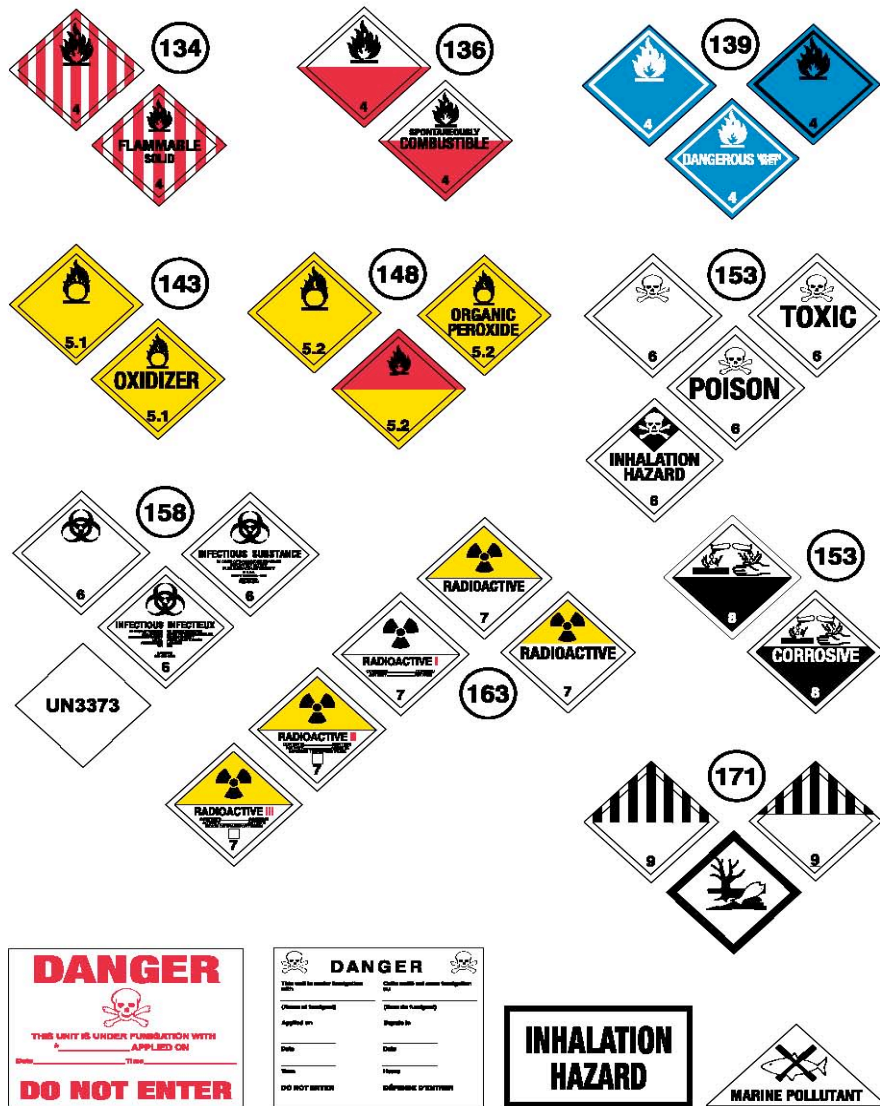
Use this table only if material cannot be specifically identified by using the shipping document, placard, or labels

TABLE OF PLACARDS AND INITIAL
USE THIS TABLE ONLY IF MATERIALS CANNOT BE SPECIFICALLY IDENTIFIED BY



RESPONSE GUIDE TO USE ON-SCENE

USING THE SHIPPING DOCUMENT, NUMBERED PLACARD, OR ORANGE PANEL NUMBER



Page 7

Each guide page provides general first responder information for the material involved. Each guide page covers two pages of the book that are accessed to the right and left when the book is opened to the appropriate guide number. All guide pages will be laid out the same with the information for each responder consideration in the same location on the page. The elements found on the guide pages are as follows:

- Potential hazards from fire or health aspects. If health hazards are listed on

the left page before fire hazards the prime threat from the material is health related. If fire is listed first the primary hazard is fire related.

- Public safety issues including isolation or evacuation distances.
- Protective clothing required for responders to work in the hazard area of the material release or spill. Many guide pages identify Structural Fire Fighting clothing will provide limited protection or provides protection only if the material is burning. This indicates that firefighters should carefully evaluate what protection is provided and what protection is not provided.
- Evacuation information for tank trucks or rail cars
- Emergency response information for fires involving the material.
- Emergency response information for spills and leaks of the material
- First aid information

Fluosilicic acid	154	1778	Gas oil	128	1202
Formaldehyde, solution, flammable	132	1198	Gasoline	128	1203
Formaldehyde, solutions (Formalin)	132	1198	Gas sample, non-pressurized, flammable, n.o.s., not refrigerated liquid	115	3167
Formaldehyde, solutions (Formalin) (corrosive)	132	2209	Gas sample, non-pressurized, poisonous, flammable, n.o.s., not refrigerated liquid	119	3168
Formic acid	153	1779	Gas sample, non-pressurized, poisonous, n.o.s., not refrigerated liquid	123	3169
Fuel, aviation, turbine engine	128	1863	Gas sample, non-pressurized, toxic, flammable, n.o.s., not refrigerated liquid	119	3168
Fuel oil	128	1202	Gas sample, non-pressurized, toxic, n.o.s., not refrigerated liquid	123	3169
Fuel oil	128	1993	GB	153	2810
Fuel oil, no. 1,2,4,5,6	128	1202	GD	153	2810
Fumaric acid	171	9126	Genetically modified micro-organisms	171	3245
Fumaryl chloride	156	1780	Genetically modified organisms	171	9278
Furaldehydes	132P	1199	Germane	119	2192
Furan	127	2389	GF	153	2810
Furfural	132P	1199	Glycerol alpha-monochlorohydrin	153	2689
Furfuraldehydes	132P	1199	Glycidaldehyde	131P	2622
Furfuryl alcohol	153	2874	Grenade, tear gas	159	2017
Furfurylamine	132	2526			
Fusee (rail or highway)	133	1325			
Fusel oil	127	1201			
GA	153	2810			
Gallium	172	2803			
Gas, refrigerated liquid, flammable, n.o.s.	115	3312			

**Guide
128**

**GUIDE
128****FLAMMABLE LIQUIDS
(NON-POLAR/WATER-IMMISCIBLE)****ERG2012****POTENTIAL HAZARDS****FIRE OR EXPLOSION**

- **HIGHLY FLAMMABLE:** Will be easily ignited by heat, sparks or flames.
- Vapors may form explosive mixtures with air.
- Vapors may travel to source of ignition and flash back.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Vapor explosion hazard indoors, outdoors or in sewers.
- Those substances designated with a (P) may polymerize explosively when heated or involved in a fire.
- Runoff to sewer may create fire or explosion hazard.
- Containers may explode when heated.
- Many liquids are lighter than water.
- Substance may be transported hot.
- For UN3166, if Lithium ion batteries are involved, also consult GUIDE 147.
- **If molten aluminum is involved, refer to GUIDE 169.**

HEALTH

- Inhalation or contact with material may irritate or burn skin and eyes.
- Fire may produce irritating, corrosive and/or toxic gases.
- Vapors may cause dizziness or suffocation.
- Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY

- **CALL EMERGENCY RESPONSE Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.**
- As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind.
- Keep out of low areas.
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters' protective clothing will only provide limited protection.

EVACUATION**Large Spill**

- Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE

FIRE

CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

CAUTION: For mixtures containing alcohol or polar solvent, alcohol-resistant foam may be more effective.

Small Fire

- Dry chemical, CO₂, water spray or regular foam.

Large Fire

- Water spray, fog or regular foam.
- **Do not use straight streams.**
- Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Prevent entry into waterways, sewers, basements or confined areas.
- A vapor suppressing foam may be used to reduce vapors.
- Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
- Use clean non-sparking tools to collect absorbed material.

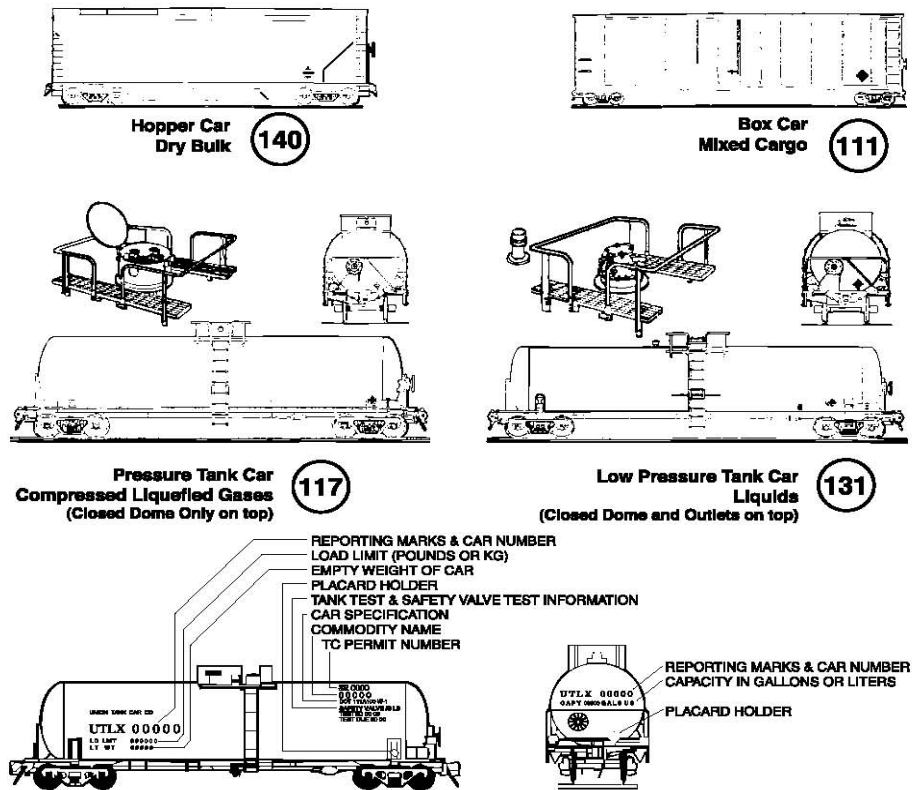
Large Spill

- Dike far ahead of liquid spill for later disposal.
- Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID

- Move victim to fresh air.
- Call 911 or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Wash skin with soap and water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim warm and quiet.
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

RAIL CAR IDENTIFICATION CHART*



CAUTION: Emergency response personnel must be aware that rail tank cars vary widely in construction, fittings and purpose. Tank cars could transport products that may be solids, liquids or gases. The products may be under pressure. It is essential that products be identified by consulting shipping documents or train consist or contacting dispatch centers before emergency response is initiated.

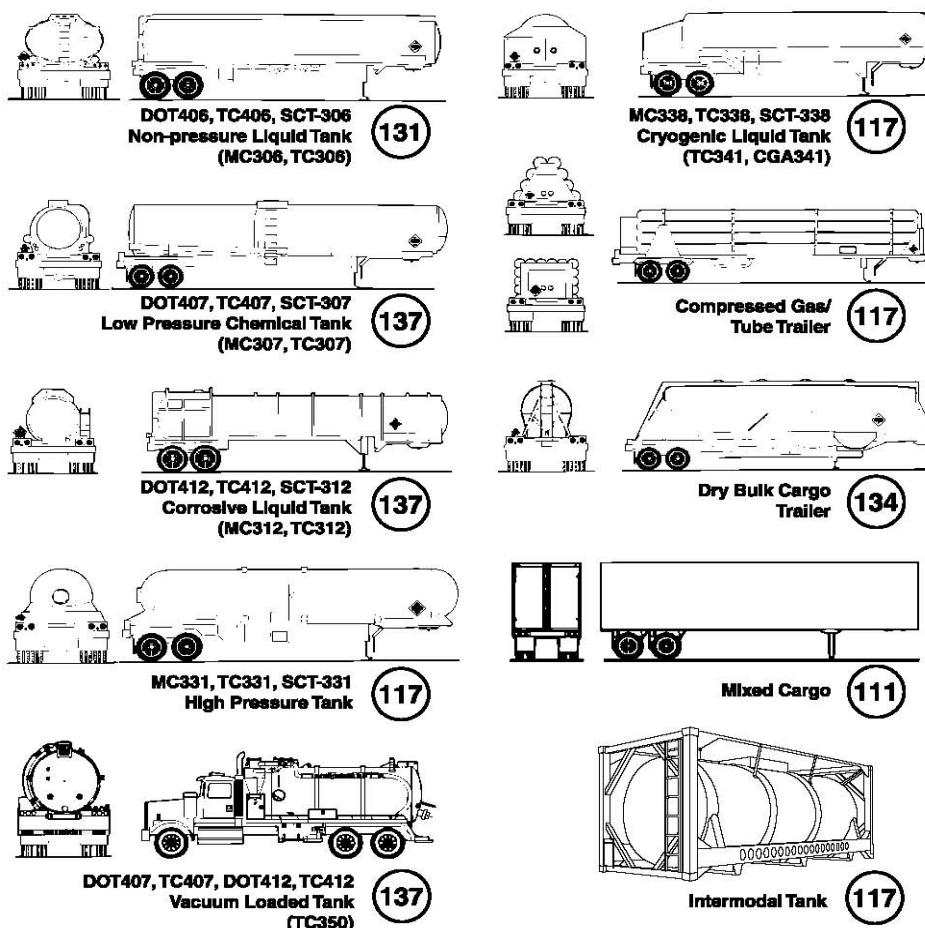
The information stenciled on the sides or ends of tank cars, as illustrated above, may be used to identify the product utilizing:

- the commodity name shown; or
- the other information shown, especially reporting marks and car number which, when supplied to a dispatch center, will facilitate the identification of the product.

* **The recommended guides should be considered as last resort if the material cannot be identified by any other means.**

Page 8

Generic pages are also provided to identify various tanks, containers, or vessels used to ship a hazardous material. Pictures of the vehicles are provided and an appropriate guide page number found inside a circle that indicates the appropriate guide page to go to. As an example a low pressure rail car is capable of carrying materials that generate a pressure up to 100 psi. One characteristic of this car is that all piping and valves will typically be found exposed. A high pressure car will typically have all piping and valves contained under a dome cover. The correct guide page indicated for a low pressure car would be 131 while the page for a pressurized car would be 117.

ROAD TRAILER IDENTIFICATION CHART*

CAUTION: This chart depicts only the most general shapes of road trailers. Emergency response personnel must be aware that there are many variations of road trailers, not illustrated above, that are used for shipping chemical products. The suggested guides are for the most hazardous products that may be transported in these trailer types.

* The recommended guides should be considered as last resort if the material cannot be identified by any other means.

Page 9

Intermodal containerized materials are placed in containers without wheels. An intermodal container is transported by ship or on a flat rail car. Rail cars are often stacked two intermodal containers high while a ship may be 20 containers high on its deck. For highway transport these containers are placed on a truck frame, secured to the frame, and transported. It is a common practice today for entire ship loads of containers to be placed on rail cars in a port on the east coast and transported across the country to another port on the West coast where it is once again reloaded onto another ship and placed on its way across the ocean.

The key to obtaining critical response information is to first identify the material or its four digit UN number. This will provide an appropriate guide page to consult. Materials are listed alphabetically by product name in the blue bordered pages and numerically by its UN number in the yellow bordered pages.

Some materials pose significant risks that require specific isolation or evacuation guidance. These materials' names will be highlighted in green on the corresponding blue or yellow bordered pages. This is informing you that in addition to the guide page that there is specific isolation or evacuation information to be found for that material in the isolation tables found in the green pages near the back of the book. The isolation table lists isolation (evacuation) distances for small spills and large spills. As a general rule of thumb a container of 55 gallons or less is considered a small spill and over that amount is a large spill. In addition there are different distances for day time incidents that for night time incidents. Generally atmospheric conditions are different at night with less thermal heating which causes less material rising into the atmosphere.

Page 302

TABLE OF INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES

		SMALL SPILLS				LARGE SPILLS							
		(From a small package or small leak from a large package)				(From a large package or from many small packages)							
ID No.	NAME OF MATERIAL	First ISOLATE in all Directions		Then PROTECT persons Downwind during-		First ISOLATE in all Directions		Then PROTECT persons Downwind during-					
		Meters	(Feet)	DAY	NIGHT	Meters	(Feet)	DAY	NIGHT				
				Kilometers (Miles)	Kilometers (Miles)			Kilometers (Miles)	Kilometers (Miles)				
1005	Ammonia, anhydrous	30 m	(100 ft)	0.1 km	(0.1 mi)	0.1 km	(0.1 mi)	60 m	(200 ft)	0.6 km	(0.4 mi)	2.2 km	(1.4 mi)
1005	Ammonia, anhydrous, liquefied												
1005	Ammonia, solution, with more than 50% Ammonia												
1005	Anhydrous ammonia												
1005	Anhydrous ammonia, liquefied												
1008	Boron trifluoride	30 m	(100 ft)	0.1 km	(0.1 mi)	0.6 km	(0.4 mi)	180 m	(600 ft)	1.8 km	(1.1 mi)	4.8 km	(3.0 mi)
1008	Boron trifluoride, compressed												
1016	Carbon monoxide	30 m	(100 ft)	0.1 km	(0.1 mi)	0.1 km	(0.1 mi)	90 m	(300 ft)	0.7 km	(0.4 mi)	2.4 km	(1.5 mi)
1016	Carbon monoxide, compressed												
1017	Chlorine	30 m	(100 ft)	0.2 km	(0.2 mi)	1.2 km	(0.8 mi)	240 m	(800 ft)	2.4 km	(1.5 mi)	7.4 km	(4.6 mi)
1023	Coal gas	30 m	(100 ft)	0.2 km	(0.1 mi)	0.2 km	(0.1 mi)	60 m	(200 ft)	0.4 km	(0.2 mi)	0.5 km	(0.3 mi)
1023	Coal gas, compressed												
1026	Cyanogen	30 m	(100 ft)	0.2 km	(0.2 mi)	1.2 km	(0.8 mi)	120 m	(400 ft)	1.1 km	(0.7 mi)	4.3 km	(2.7 mi)
1026	Cyanogen, liquefied												
1026	Cyanogen gas												
1040	Ethylene oxide	30 m	(100 ft)	0.1 km	(0.1 mi)	0.2 km	(0.1 mi)	90 m	(300 ft)	0.8 km	(0.5 mi)	2.4 km	(1.5 mi)
1040	Ethylene oxide with Nitrogen												
1045	Fluorine	30 m	(100 ft)	0.2 km	(0.1 mi)	0.5 km	(0.3 mi)	90 m	(300 ft)	0.8 km	(0.5 mi)	3.5 km	(2.2 mi)
1045	Fluorine, compressed												
1048	Hydrogen bromide, anhydrous	30 m	(100 ft)	0.1 km	(0.1 mi)	0.5 km	(0.3 mi)	180 m	(600 ft)	1.8 km	(1.1 mi)	5.7 km	(3.6 mi)
1050	Hydrogen chloride, anhydrous	30 m	(100 ft)	0.1 km	(0.1 mi)	0.4 km	(0.3 mi)	360 m	(1200 ft)	3.6 km	(2.2 mi)	10.4 km	(6.5 mi)
1051	AC (when used as a weapon)	60 m	(200 ft)	0.2 km	(0.1 mi)	0.5 km	(0.3 mi)	500 m	(1500 ft)	1.7 km	(1.0 mi)	3.9 km	(2.4 mi)

The newest challenge to hazardous materials is the criminal element associated with Weapons of Mass Destruction. After a chemical release in the Tokyo, Japan subway that killed 13 people there has been an increased level of preparedness for responders in the area of Chemical and Biological weapons. The 2012 Emergency Response Guidebook provides some general information for responders if they suspect the release of such a material. This information can be found in the white section at the back of the book.

The 2012 Emergency Response Guidebook now provides specific Initial Isolation and Protective Action Isolation distances for different quantities of six of the most common Toxic Inhalation Hazard (TIH) gases (Table 3). Table 3 gives the responder specific isolation distances dependent upon the container size, time of day, and wind speed.

TABLE 3 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES FOR DIFFERENT QUANTITIES OF SIX COMMON TIH GASES									
TRANSPORT CONTAINER	UN 1005 Ammonia, anhydrous: Large Spills								
	First ISOLATE in all Directions	Then PROTECT persons Downwind during							
		DAY			NIGHT				
		Low wind (< 6 mph = < 10 km/h)	Moderate wind (6-12 mph = 10 - 20 km/h)	High wind (> 12 mph = > 20 km/h)	Low wind (< 6 mph = < 10 km/h)	Moderate wind (6-12 mph = 10 - 20 km/h)	High wind (> 12 mph = > 20 km/h)		
	Meters (Feet)	Km (Miles)	Km (Miles)	Km (Miles)	Km (Miles)	Km (Miles)	Km (Miles)	Km (Miles)	Km (Miles)
Rail tank car	300 (1000)	2.3 (1.4)	1.3 (0.8)	1.0 (0.6)	6.3 (3.9)	2.6 (1.6)	1.3 (0.8)		
Highway tank truck or trailer	125 (400)	1.0 (0.6)	0.5 (0.3)	0.3 (0.2)	2.6 (1.6)	0.8 (0.5)	0.5 (0.3)		
Agricultural nurse tank	60 (200)	0.6 (0.4)	0.3 (0.2)	0.3 (0.2)	1.5 (0.9)	0.5 (0.3)	0.3 (0.2)		
Multiple small cylinders	30 (100)	0.3 (0.2)	0.1 (0.1)	0.1 (0.1)	0.8 (0.5)	0.3 (0.2)	0.1 (0.1)		
TRANSPORT CONTAINER	UN 1017 Chlorine: Large Spills								
Rail tank car	1000 (3000)	11+ (7+)	9.0 (5.6)	5.5 (3.4)	11+ (7+)	11+ (7+)	7.1 (4.4)		
Highway tank truck or trailer	1000 (3000)	6.0 (6.6)	3.5 (2.2)	2.9 (1.8)	11+ (7+)	5.5 (3.4)	4.2 (2.6)		
Multiple ton cylinders	400 (1250)	4.0 (2.5)	1.5 (0.9)	1.1 (0.7)	7.9 (4.9)	2.7 (1.7)	1.5 (0.9)		
Multiple small cylinders or single ton cylinder	250 (800)	2.6 (1.6)	1.0 (0.6)	0.8 (0.5)	5.6 (3.5)	1.8 (1.1)	0.8 (0.5)		

"+" means distance can be larger in certain atmospheric conditions

The 2012 Emergency Response Guidebook provides a Boiling Liquid Expanding Vapor Explosion (BLEVE) precautions chart. The chart gives general information for cooling water flows, evacuation distances, time until the tank is empty, and time until tank failure. It is important to remember that a BLEVE can occur even with non-flammable materials. The chart should be used with extreme caution due to the vast amount of variables which may impact the way the container will react to the stresses of flame impingement.

Capacity	Diameter	Length	Propane Mass	Minimum time to failure for severe torch	Approximate time to empty for engulfing fire	Fireball radius	Emergency response distance	Minimum evacuation distance	Preferred evacuation distance	Cooling water flow rate	
Litres (Gallons)	Meters (Feet)	Meters (Feet)	Kilograms(Lbs)	Minutes	Minutes	Meters(Feet)	Meters (Feet)	Meters (Feet)	Meters (Feet)	Litres/min	USgal/min
100 (38.6)	0.3 (1)	1.5 (4.9)	40 (88)	4	8	10 (33)	90 (295)	154 (505)	307 (1007)	94.6	25
400 (154.4)	0.61 (2)	1.5 (4.9)	160 (353)	4	12	16 (53)	90 (295)	244 (801)	488 (1601)	189.3	50
2000 (772)	0.96 (3.2)	3 (9.8)	800 (1764)	5	18	28 (92)	111 (364)	417 (1368)	834 (2736)	424	112
4000 (1544)	1 (3.3)	4.9 (16.1)	1600 (3527)	5	20	35 (115)	140 (459)	525 (1722)	1050 (3445)	598	158
8000 (3088)	1.25 (4.1)	6.5 (21.3)	3200 (7055)	6	22	44 (144)	176 (577)	661 (2169)	1323 (4341)	848	224
22000 (8492)	2.1 (6.9)	6.7 (22)	8800 (19400)	7	28	62 (203)	247 (810)	926 (3038)	1852 (6076)	1404	371
42000 (16212)	2.1 (6.9)	11.8 (38.7)	16800 (37037)	7	32	77 (253)	306 (1004)	1149 (3770)	2200 (7218)	1938	512
82000 (31652)	2.75 (9)	13.7 (45)	32800 (72310)	8	40	96 (315)	383 (1257)	1435 (4708)	2200 (7218)	2710	716
140000 (54040)	3.3 (10.8)	17.2 (56.4)	56000 (123457)	9	45	114 (374)	457 (1499)	1715 (5627)	2200 (7218)	3539	935

The 2012 Emergency Response Guidebook now provides responders with a Safe Stand Off Distance chart for Improvised Explosive Devices (IED). This chart provides information on building and outdoor evacuation distances for various sizes of IED for both Liquefied Petroleum Gas and High Explosives.

	Threat Description	Explosives Mass (TNT equivalent) ¹		Building Evacuation Distance ²		Outdoor Evacuation Distance ³	
High Explosives (TNT Equivalent)	Pipe Bomb	5 lbs	2.3 kg	70 ft	21 m	850 ft	259 m
	Suicide Belt	10 lbs	4.5 kg	90 ft	27 m	1,080 ft	330 m
	Suicide Vest	20 lbs	9 kg	110 ft	34 m	1,360 ft	415 m
	Briefcase/Suitcase Bomb	50 lbs	23 kg	150 ft	46 m	1,850 ft	564 m
	Compact Sedan	500 lbs	227 kg	320 ft	98 m	1,500 ft	457 m
	Sedan	1,000 lbs	454 kg	400 ft	122 m	1,750 ft	534 m
	Passenger/Cargo Van	4,000 lbs	1 814 kg	640 ft	195 m	2,750 ft	838 m
	Small Moving Van/ Delivery Truck	10,000 lbs	4 536 kg	860 ft	263 m	3,750 ft	1 143 m
	Moving Van/Water Truck	30,000 lbs	13 608 kg	1,240 ft	375 m	6,500 ft	1 982 m
	Semitrailer	60,000 lbs	27 216 kg	1,570 ft	475 m	7,000 ft	2 134 m

	Threat Description	LPG Mass/ Volume ¹		Fireball Diameter ⁴		Safe Distance ⁵	
Liquefied Petroleum Gas (LPG - Butane or Propane)	Small LPG Tank	20 lbs/5 gal	9 kg/19 L	40 ft	12 m	160 ft	48 m
	Large LPG Tank	100 lbs/25 gal	45 kg/95 L	69 ft	21 m	276 ft	84 m
	Commercial/ Residential LPG Tank	2,000 lbs/500 gal	907 kg/1 893 L	184 ft	56 m	736 ft	224 m
	Small LPG Truck	8,000 lbs/2,000 gal	3 630 kg/7 570 L	292 ft	89 m	1,168 ft	356 m
	Semitanker LPG	40,000 lbs/10,000 gal	18 144 kg/37 850 L	499 ft	152 m	1,996 ft	608 m

A chemical that polymerizes is one that presents an extreme danger to responders. Polymerization is a runaway chain reaction that once started cannot be stopped. If material is contained, it will rupture the container in a violent manner, sending pieces of the container for a considerable distance. The materials may be also highly flammable which may result in a fire when the container ruptures. This reaction occurs when the chemicals are exposed to heat or contamination.

Because of this hazard the ERG identifies these materials by placing a “P” after the guide number in the yellow and blue bordered pages

ID No.	Guide No.	Name of Material	ID No.	Guide No.	Name of Material
—	112	Ammonium nitrate-fuel oil mixtures	1014	122	Oxygen and Carbon dioxide mixture, compressed
—	158	Biological agents	1015	126	Carbon dioxide and Nitrous oxide mixture
—	112	Blasting agent, n.o.s.	1015	126	Nitrous oxide and Carbon dioxide mixture
—	112	Explosives, division 1.1, 1.2, 1.3 or 1.5	1016	119	Carbon monoxide
—	114	Explosives, division 1.4 or 1.6	1016	119	Carbon monoxide, compressed
—	153	Toxins	1017	124	Chlorine
1001	116	Acetylene	1018	126	Chlorodifluoromethane
1001	116	Acetylene, dissolved	1018	126	Refrigerant gas R-22
1002	122	Air, compressed	1020	126	Chloropentafluoroethane
1003	122	Air, refrigerated liquid (cryogenic liquid)	1020	126	Refrigerant gas R-115
1003	122	Air, refrigerated liquid (cryogenic liquid), non-pressurized	1021	126	1-Chloro-1,2,2,2-tetrafluoroethane
1005	125	Ammonia, anhydrous	1021	126	Chlorotetrafluoroethane
1005	125	Anhydrous ammonia	1021	126	Refrigerant gas R-124
1006	121	Argon	1022	126	Chlorotrifluoromethane
1006	121	Argon, compressed	1022	126	Refrigerant gas R-13
1008	125	Boron trifluoride	1023	119	Coal gas
1008	125	Boron trifluoride, compressed	1023	119	Coal gas, compressed
1009	126	Bromotrifluoromethane	1026	119	Cyanogen
1009	126	Refrigerant gas R-13B1	1026	119	Cyanogen gas
1010	116P	Butadienes, stabilized	1027	115	Cyclopropane
1010	116P	Butadienes and hydrocarbon mixture, stabilized	1028	126	Dichlorodifluoromethane
1011	115	Butane	1028	126	Refrigerant gas R-12
1011	115	Butane mixture	1029	126	Dichlorofluoromethane
1012	115	Butylene	1029	126	Refrigerant gas R-21
1013	120	Carbon dioxide	1030	115	1,1-Difluoroethane
1013	120	Carbon dioxide, compressed	1030	115	Difluoroethane
1014	122	Carbon dioxide and Oxygen mixture, compressed	1030	115	Refrigerant gas R-152a
			1032	118	Dimethylamine, anhydrous
			1033	115	Dimethyl ether

ACTIVITY 3

Individual activity

10 Minutes

Purpose: The purpose of this activity is to review the information found in the US Department of Transportation Emergency Response Guidebook and determine the most appropriate manner to utilize the material.

Directions:

1. Refer to your activity 1-3 work sheet.
2. There are six questions regarding various parts of the ERG. The instructor will provide you an opportunity to read the question that will reference to a specific portion of the ERG.
3. The instructor will show you a slide of the particular item being discussed.
4. Record a short answer to the question.
5. The instructor will call upon selected students for their answers.

Summary: The US DOT publishes an Emergency Response Guidebook every three years that can provide valuable information to emergency responders for incidents involving hazardous materials. It is critical to understand the value of the document and how to reference its contents.

ACTIVITY 3 WORKSHEET

1. Which of the hazard zones is the most lethal from an inhalation hazard?
2. What is the importance of the Emergency Contact number listed on the shipping paper?
3. What is the significance of the number 121 inside the circle next to the green placard titled “non-flammable” Gas?
4. Which guide page would you use for a rail car involved in an incident that is a hopper or dry bulk car?
5. What is the significance of the product Boron Trifluoride with a UN #1008 that is highlighted in green?
6. What is the recommended initial isolation distance for a small leak involving Chlorine with a UN #1017 during the day?

**STATE OF NEW YORK
OFFICE OF FIRE PREVENTION AND CONTROL**

HAZARDOUS MATERIALS FIRST RESPONDER AWARENESS

UNIT FOUR

Lesson Objectives

At the end of this lesson the participants will be able to:

- 1. Use signs or clues that may provide information about the presence of a hazardous material.**
- 2. Apply the Hazard First Responder Awareness Level materials covered in this course to their work locations.**

INTRODUCTION

It is critical that first responders utilize all their senses and information available when coming upon an incident that may involve hazardous materials. In addition to placards or labels and the tools provided in the Department of Transportation Emergency Response Guidebook the responder should utilize all other clues available to them. As a minimum there are at least six critical recognition tools that should be utilized. Those tools include the occupancy or location, container shapes, markings and colors, placards and labels, shipping papers or Material Safety Data Sheets, and our natural sense of sight and hearing. As an example, the presence of an overturned tank truck could provide several clues to a responder. The container itself can provide clues as to what is normally transported in that type of truck or trailer, the placards, the name of the company on the side, shipping papers from the driver as but some of the clues to provide guidance on what the material may be and the most appropriate actions for a person trained and equipped at the First Responder Awareness Level.

UTILIZING THE SIX CLUES

The occupancy or location could provide significant clues as to the materials that may be present. As an example a welding shop would have both flammable and nonflammable gases, a cold storage refrigerated facility may have large quantities of anhydrous ammonia, or other refrigerant, while a single family dwelling residence with a swimming pool would be expected to have pool chemicals such as chlorine or cleaning materials.

Most all residential buildings have some hazardous materials onsite. This could include cleaning materials, drain openers, gasoline for the lawnmower, or propane for the barbecue. Industrial occupancies could utilize many different materials and have large quantities in storage onsite. Mercantile facilities may have a significant amount of hazardous materials as well. Some examples could include dry cleaning facilities, hardware stores, pharmacies, general merchandise stores, or lumber yards.

Containers can provide a clue to the type of material carried. It is difficult to carry a liquid in a paper bag or to get coal inside a gasoline truck. Highway transports generally carry packaged freight in box trailers, liquids in liquid trailers, compressed gases in compressed gas trailers, compressed gas in high pressure tube trailers, and dry material such as fertilizer in hopper or dry bulk trailers. One important consideration is to determine if the container is a pressurized unit. This is usually determined by the roundness of the ends of a tank or cylinder. A propane delivery truck is carrying a liquid (Liquefied Compressed Gas) that is exerting pressure inside the container. At 70 degrees the pressure inside the tank may be as much as 120 pounds. Small tube trailers can carry compressed gases with a pressure as high as 5,000 pounds. Rail transport containers are similar to the highway transport vehicles. One difference has been previously discussed with low and high pressure liquid rail cars. Water transport may contain bulk cargo in tanks or may carry containers either in intermodal containers or in the ships hold. The transportation of hazardous materials on passenger flights is highly restricted. However on freight flights most materials can be transported. Fixed site containers usually mirror those used for highway or rail transport. While containers may be used for different materials the

characteristics of the materials in those containers will be similar. As an example a tank may be used for propane storage or the same tank may be used for anhydrous ammonia storage. If it is under transport on a public highway it must be marked accordingly. Markings such as railcar stencils, company names, or other markings may provide clues as to what is in the container.

Identification of markings at fixed site in New York State may fall under several regulations requiring the notification of the presence of a hazardous material. Under the 1986 Federal legislation referred to as SARA (Superfund Amendment Reauthorization Act) many facilities storing or using hazardous materials were required to report their presence to their County Local Emergency Planning Committee, the State, and their local fire department. State regulations also require the reporting of the presence of hazardous materials to both the fire department as well as the local code official. The New York State Uniform Fire Prevention and Building Code provides that the local codes official can require the marking of any facility storing a hazardous material to identify the material. Many local communities have also adopted local regulations requiring the marking of such facilities.

One common method of marking is the use of the National Fire Protection Association (NFPA) 704 standard. This utilizes a square divided into four sections and placed so that one corner of the square is pointing up and the opposite side pointing down. This square is divided into four areas and color coded. The color red indicates the hazards from fire, the color blue indicates health risks, the color yellow indicates reactivity, and white indicates special hazards. As an example a w with a slash through it in the white area would indicate the material is water reactive. Inside the red, blue, or yellow blocks will be a number ranging from 0 to 4. The number 0 would represent no hazard and a 4 would indicate the highest possible hazard. While this system does not inform the responder as to what material may be present it does provide valuable clues as to the dangers from the material present.

Placards and labels are also a useful and common way to identify hazardous materials in commerce. Placarding isn't always required on all loads being transported; the requirements are depended on several factors. The two main requirements are the nature of the product and the weight. Some materials do not require the vehicle to have a placard displayed unless there's 1001 pounds or more on board, while other products require placards regardless of quantity. These are referred to Table 1 and Table 2 commodities. A good quick reference source for this information is the DOT Chart 15. The placard itself will give the responder information about the product though the use of graphics, background color, hazard class number, and the UNID number. The "Dangerous" placard may be used under certain circumstances in which the cargo is a mixed load and doesn't fall into one of the other 9 hazard classes. In some situations the responder may find that the vehicle doesn't have a placard, however the individual packages are labeled with either the Globally Harmonized System (GHS) label or a label which mirrors the placard system. Both labeling systems will provide the responder with hazard information.

The GHS labeling system was developed to standardize and harmonize the identification and labeling of hazardous materials based on standard criteria. The system is used on labels and Safety Data Sheets to communicate and define the health, environmental, and physical hazards of the substance. The labels will identify the product name, UNID number, signal word, precautionary statement, hazard statement, responsible party, and a standard pictogram. The

standard pictograms developed under the GHS system allow for identification of hazards regardless of reading or language barriers.

Shipping papers are a valuable tool to identify hazardous materials. The responder must know who is responsible for the custody of the papers, and where they can be found in each mode of transportation. The documents will list the product name, container type, quantity, UNID number, hazard class, and packing group. In certain cases where there are multiple containers, such as a train, the shipping paper will help identify where the material is located in the shipment.

Under the new standards Material Safety Data Sheets (MSDS) are now referred to as Safety Data Sheets (SDS). Safety Data Sheets (SDS) are often available and can provide critical product specific information similar to that provided in the DOT ERG. Safety Data Sheets contain information about several aspects of the material. New standards require Safety Data Sheets to be in a standard 16 section format for ease of finding critical information. Information contained includes the product name, general information about the product, ingredient or formulation information, physical or chemical characteristics, fire and explosion hazard data, reactivity data, health hazard data, and precautions for safe handling, control measures, transportation data, disposal data, and label data.

The SDS provided for Gasoline was obtained from:

http://www.tsocorp.com/stellent/groups/corpcomm/documents/tsocorp_documents/msdsunleaded.pdf

ACTIVITY 4

Purpose: In order to apply the course materials covered in this material it is necessary to apply the skills to your own environment. It will be most meaningful if the can apply this information to your own home, local industrial facilities, and mercantile establishments. In addition you should consider the transportation aspects of your community, the observations of placards on vehicles or labels on containers, or the storage containers that contain a hazardous material.

Directions: Identify at least three clues that suggest the presence of hazardous materials, what are the dangers from those materials, and what actions should you initiate at the First Responder Awareness Level for each of the following?

Single family residence:

Multiple family residences:

Industrial or manufacturing facility:

Mercantile establishment:

Highway transport:

Fixed storage facility such as gasoline, propane, oxygen, etc.:

Other: