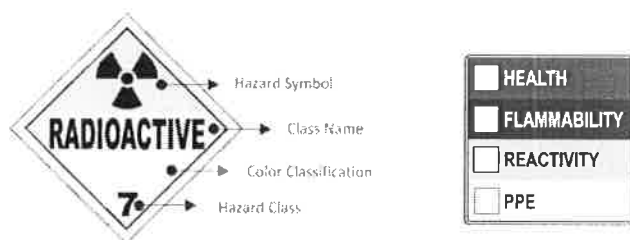


**2019 Revision**

# **OSHA HAZARDOUS MATERIALS**

## **FIRST RESPONDER AWARENESS**

### **STUDENT MANUAL**



### **Acknowledgements**

**Illinois Fire Service Institute  
Illinois Emergency Management Agency**

**Presented to the  
Chicago Police Department Summer 2019**





# OSHA Hazardous Materials Awareness

Acknowledgments  
Illinois Emergency Management Agency  
Illinois Fire Service Institute



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## HAZARDOUS MATERIALS United States Department of Transportation (DOT)

**A substance or material which  
has been determined by  
the Secretary of Transportation  
to be capable of posing an  
unreasonable risk  
to health, safety, and property  
when transported.**



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## HAZARDOUS CHEMICALS Occupational Health and Safety Administration (OSHA)

**The term Hazardous Chemicals is defined as  
any chemical which is a  
physical or health hazard to employees.**



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## EXTREMELY HAZARDOUS SUBSTANCES

Environmental Protection Agency  
(EPA)

**The term Extremely Hazardous Substances,  
as the name implies, refers to products that  
have extremely high toxicity.**



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**IF YOU DON'T KNOW WHAT  
THE MATERIAL IS  
TREAT IT AS A  
HAZARDOUS  
MATERIAL**



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**Laws & Regulations**



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## RELATIONSHIP OF LAWS AND REGULATIONS

- LAWS - Enacted through legislation
- REGULATIONS
  - Mandated by law
  - Tools to implement law



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## Law

### Superfund Amendments and Reauthorization Act (SARA)



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## RIGHTS AND RESPONSIBILITIES

### Superfund Amendments and Reauthorization Act (SARA)

- Standard of Care
- Title I and III of the Superfund
- Local Emergency Response Plan
- Levels of Response
- Incident Command System



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## STANDARD OF CARE

The level of competency anticipated or mandated  
in the performance of  
a service or duty



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## STANDARD OF CARE IS INFLUENCED BY:

- Laws and Regulations
- Standards and Guidance
- Knowledge and Experience



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## SUPERFUND AMENDMENTS & REAUTHORIZATION ACT (SARA):

### Title I

Worker Protection Standards

### Title III

Emergency Planning and Community Right-  
to-Know Act



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## Worker Protection Standards: Title I

Requires all states to address the risk of injury to government employees by mandating specialized training and planning for any personnel involved in hazardous waste operations or emergency response activities.



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## Emergency Planning and Community Right-to-Know Act: Title III

- Emergency Planning
- Emergency Notification
- Community Right-to-Know Reporting Requirements
- Toxic Chemical Release and Emissions Inventory Reporting



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## Functions of the State Emergency Response Commission

Illinois Emergency Management Agency (IEMA) was designated the State Emergency Response Commission (SERC) on January 27, 1987 by the Governor of Illinois



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## Functions of the Local Emergency Planning Committee

The Local Emergency Planning Committee (LEPC) has responsibility to:

- Develop emergency plans for the jurisdiction they serve
- Process requests from the public regarding hazardous materials



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## Regulation

OSHA 29 CFR 1910.120



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## Awareness Level Training

Personnel at the Awareness Level are individuals who are likely to witness or discover a release and would take no further action beyond notifying the authorities of the release.



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## Other Rights & Responsibilities Afforded by Law

- Medical Surveillance
- The Illinois Department of Labor (IDOL) has jurisdiction for enforcing OSHA rules for government employees.



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## Incident Command System (ICS)

- Awareness Level personnel start the ICS process by notifying Emergency Response Agencies of an incident
- Incident Commanders must have completed:
  - Awareness Training
  - First Responder Operations Training
  - On-Scene Incident Commander Training



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## Incident Command System (ICS)

A safety officer knowledgeable in the operations being performed must be assigned to identify and evaluate hazards and to assure the safe conduct of the operation.

Must be trained at the level of the hazardous materials response.



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## Module 1 Summary



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## OSHA Hazardous Materials Awareness

### Module 2: Health Hazards of Hazardous Materials



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## Exposure

- Exposure is being in physical proximity to a hazard, such that injury may occur
- Severity of an injury depends on the substance involved and the susceptibility of the individual
- A person can be exposed without being contaminated



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## Types of Exposure


**ACUTE:**

Develops quickly, usually after exposure at high concentrations of hazardous substance


Example:  
Contact with concentrated nitric acid can cause an acid burn of skin



**Danger**  
Acid



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## Types of Exposure


**CHRONIC:**

Takes a long time to develop, or requires exposure over a long period of time, usually at low concentrations


Example:  
Breathing asbestos can result in lung diseases many years after exposure



**DANGER**  
**ASBESTOS**  
MAY CAUSE CANCER  
CAUSES DAMAGE TO LUNGS  
AUTHORIZED PERSONNEL ONLY



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## Contamination

- Implies direct physical contact with a hazardous substance
- May be spread from a contaminated individual to others
- A person who is contaminated, is being exposed





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## Types of Harm

- **INTERNAL HARM:**  
Affects the internal organs
- **EXTERNAL HARM:**  
Affects or damages the outer tissues



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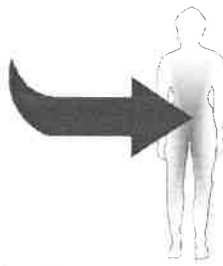
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## How Hazardous Materials Enter The Body

- Inhalation
- Absorption
- Ingestion
- Injection



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## HOW DOES THE BODY REACT?

- Confusion
- Light Headedness
- Anxiety
- Coughing or Painful Respiration
- Tingling or Numbness of Extremities
- Changes of Behavior / Mannerisms



- Unconsciousness
- Dizziness
- Blurred or Double Vision
- Change in Skin Color or Blushing
- Loss of Coordination
- Nausea, Vomiting, Cramping, and Diarrhea



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## Health Hazards

- Irritants
- Asphyxiants
- Poisons
- Carcinogens
- Corrosives

- Cryogenics
- Radiation
- Etiological Harm
- Psychological Harm

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## Radiation



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## Radiation

- Radiation is energy which is emitted, transmitted, or absorbed in wave or energetic particle form
- There are four basic types of ionizing radiation:

 <b>Alpha Particles</b>	 <b>Gamma Rays</b>
 <b>Beta Particles</b>	 <b>Neutrons</b>

**Each of these types affects us differently**

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## Radiation Video

\*Single click below to play





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## Protection From Radiation

- Time
- Distance
- Shielding

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## Time, Distance, Shielding Video

\*Single click below to play video





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## What's wrong with this picture?

- Avoid taking unnecessary risks
- Your senses do not provide adequate warning of the presence of hazardous materials



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## Measures of Toxicity & Exposure Levels



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## Exposure Levels

### PEL (Permissible Exposure Limits)

- A term used by OSHA in its standards covering exposures comparable to TWA
- Maximum time-weighted concentration at which 95% of exposed healthy adults suffer no adverse effects over a 40 hour work week based on an 8 hour, time-weighted average concentration
- Legally enforceable by OSHA



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## Exposure Levels

### Immediately Dangerous to Life and Health (IDLH)

An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to self rescue from a dangerous atmosphere



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## Guidelines to Limit Contamination

- Look for signs that hazardous materials may be present
- Isolate the area
- Attempt to identify the product
- Do not walk into, touch, or inhale any released materials
- Stay uphill and upwind from incident
- Request additional assistance



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## Guidelines to Limit Contamination

- Time
- Distance
- Shielding



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## Protective Measures

- Standard work uniforms and street clothes do not provide protection from hazardous materials
- Specialized chemical protective clothing is needed to protect an appropriately trained responder



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## Module 2 Summary



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## OSHA Hazardous Materials Awareness

Module 3: Hazardous Materials Identification



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## METHODS OF DETECTING HAZARDOUS MATERIALS

- Occupancy and Location
- Container Shapes and Sizes
- Markings and Colorings
- Placards and Labels
- Shipping Papers/MSDS
- Monitoring Devices
- Your Senses



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## Occupancies & Locations TRANSPORTATION

- Roadway Transportation
- Railway Transportation
- Waterway Transportation
- Air Transportation
- Pipeline Transportation



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## Occupancies & Locations FIXED FACILITIES

- |   |                            |
|---|----------------------------|
| • Service Stations                      | • Industrial Sites         |
| • Hardware Stores                       | • Residences               |
| • Laboratories and Medical Facilities   | • Shops & Stores           |
| • Doctor and Dentist Offices            | • Construction Sites       |
| • Farms & Associated Service Industries | • Educational Institutions |
|   | • Military Installations   |



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## Roadway Transportation



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### ATMOSPHERIC PRESSURE TANK MC 306/DOT 406



- Oval shaped
- Carries flammable and combustible liquids usually lighter than water such as petroleum products



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### LOW PRESSURE CHEMICAL TANK MC 307/DOT 407



Insulated



Non-Insulated

- Horseshoe shaped or round
- Carries chemicals at low pressures, may include flammables, mild corrosives, poisons, or oxidizing solutions



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## CORROSIVE LIQUID TANK MC 312/ DOT 412



- Small, cylindrical, with exterior stiffening rings
- Carries corrosive liquids, such as strong acids and bases

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## HIGH PRESSURE LIQUEFIED GAS TANK MC 331



- Rounded heads on both ends and bolted manhole at the rear
- Carries products that have been liquefied by compression, that may include propane, butane, and anhydrous ammonia

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## CRYOGENIC TANK MC 338



- Can be identified by the control cabinet located on the rear of the vehicle
- Carries materials which have been refrigerated to -130 deg. F or below, such as oxygen, carbon dioxide, nitrogen dioxide and helium

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## TUBE TRAILER



- Has several large compressed cylinders with rounded heads attached to a flatbed trailer
- Carries specialty gases that may include methane and methyl bromide



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## DRY BULK TRAILER



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## BOX TRUCKS & TRAILERS



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## OTHERS

- Flat Beds
- Dump Trucks
- Garbage Trucks

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## Railway Transportation

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## GENERAL SERVICE CAR





DOT 111



CPC 1232

- May contain multiple compartments structurally separated
- May or may not be insulated
- Fittings on top may be visible or shrouded with protective dome
- May have a bottom connection or washout outlet
- Carries flammable/ combustible liquids, flammable solids, oxidizers, organic peroxides, poisons, and corrosives

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## PRESSURE CAR



- Top loading
- Car will have a protective housing or dome to protect valves and gauges
- Primarily used to transport:
  - Flammable Gases
  - Nonflammable gases
  - Poison Gases

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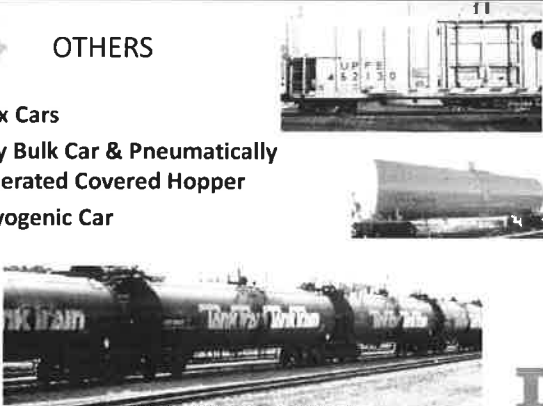
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## OTHERS

- Box Cars
- Dry Bulk Car & Pneumatically Operated Covered Hopper
- Cryogenic Car



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## Intermodal Transportation

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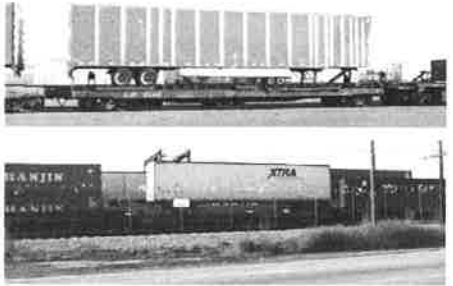
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### TOFC - Trailer On Flat Car





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### COFC - Container On Flat Car





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### INTERMODAL TANKS

#### Non-Pressure Tank Containers



- Can be transported by highway, rail, or water
- Standard size and stackable
- Can transport any class of hazardous materials

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## INTERMODAL TANKS

### Pressure Tank Containers

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## Waterway Transportation

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## Waterway Transportation

- It is estimated that 90 % of the world's cargo is transported by marine vessels
- Spills can involve miles of river or coastlines
- Most spills are from loading and unloading

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## Waterway Transportation

**Barges**

- Oil/chemical tank barges
- Liquefied gas barges

**Tank Ships (self propelled)**

- Oil/product ships
- Chemical ships

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## Air Transportation

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## Air Transportation

- Heavily regulated
- Will only transport limited quantities
- Military munitions are the main exception
- Added consideration of carrier's fuel in the event of an incident



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## Pipeline Transportation

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## PIPELINE MARKER

**REQUIRED INFORMATION:**

1. WARNING
2. PRODUCT
3. OWNER
4. EMERGENCY CONTACT NUMBER



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## Pipeline Resources

**National Pipeline Mapping System**  
 – <https://www.npms.phmsa.dot.gov/>

**Pipeline Emergencies Training Program**  
 – <http://www.pipelineemergencies.com/>

**Pipeline and Hazardous Materials Safety Administration**  
 – <http://www.phmsa.dot.gov/pipeline>

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## FIXED FACILITIES



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## CONE ROOF TANKS



- Tank with vertical cylindrical walls supporting a fixed inverted cone roof
- Stores flammable, combustible and corrosive liquids



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## COVERED FLOATING ROOF TANK



- Cone Tank with internal floating roof.
- Identified by large vents at roof wall seam.
- Stores flammable, combustible and corrosive liquids.



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## OPEN FLOATING ROOF TANKS



- Roof floats on material
- Stores flammable and combustible liquids



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## HORIZONTAL TANKS



- Horizontal cylindrical tank sitting on supports
- Stores flammable and combustible liquids, corrosives and poisons



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## HORIZONTAL PRESSURE TANKS



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## SPHERICAL TANKS



- Single shell non-insulated tank
- Stores LP gases and vinyl chloride



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## Underground Storage Tanks

- Primary Storage is Petroleum Products
- CLUES:
  - Vents
  - Fill Points
  - Occupancy or Location



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## INDIVIDUAL CONTAINERS Open-Top and Closed-Top Drums



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## INDIVIDUAL CONTAINERS

- Dewars and Flasks
- Totes
- Cryogenic Containers
- Radioactive Material Containers
- Cylinders





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## CRYOGENIC CONTAINERS



- Must be heavily insulated
- Safety relief valves and rupture disks vent off excess pressures
- Common types
  - Dewars
  - Cylinders tanks



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## RADIOACTIVE MATERIALS CONTAINERS



- Low-level radiation sources may be so small and inactive that the total package weighs only a few ounces
- May be packaged in fiberboard or cardboard boxes, wooden boxes, or steel drums



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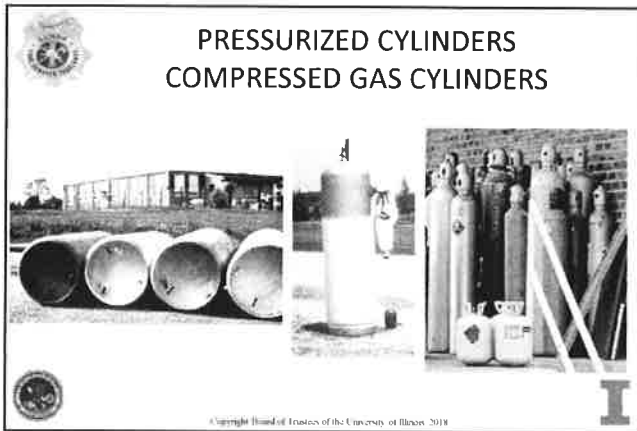
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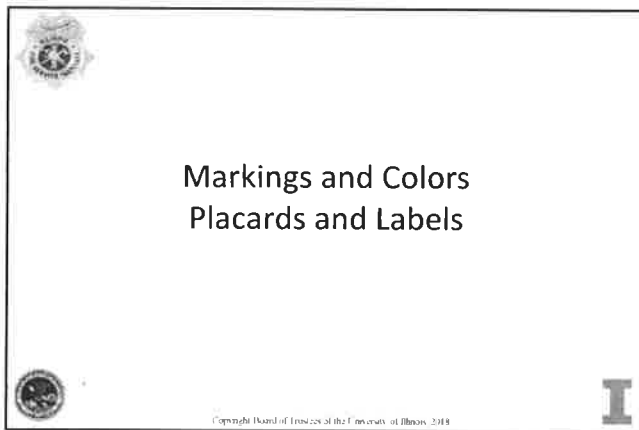
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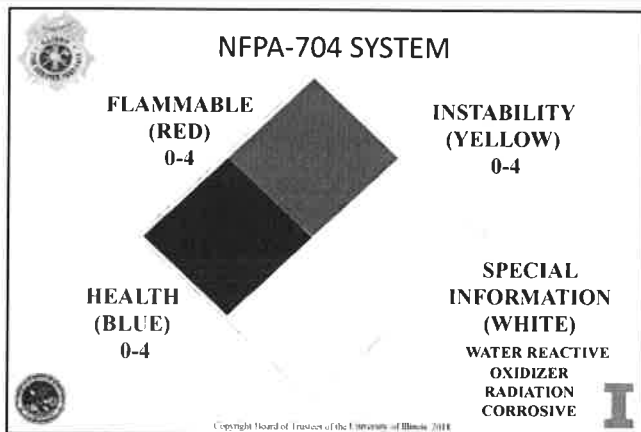
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## U.S. MILITARY MARKERS

### FIRE DIVISION SYMBOLS

1

FLAMMABLE LIQUID OR SOLID

2

FLAMMABLE GASES

3

EXTENSIVE TOXICITY

4

EXTENSIVE TOXICITY

### CHEMICAL HAZARD SYMBOLS







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## PLACARDS, LABELS, AND MARKINGS



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## RAILCAR MARKINGS

### Reporting Marks & Car Markings

- Left side of car as you face it
- Both ends
- All rail cars



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# RAILCAR MARKINGS

**Specifications Markings**

- Right Side of Car as you face it
- On tank cars

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# DOT PLACARDS (Transportation)

- Square on pointed side (Diamond shaped)
- Affixed to each side and both ends
- May not be required
- Typically found on trucks and railcars

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**Symbol**



**Wording / ID Number**

**Color**

**UN Class Number**



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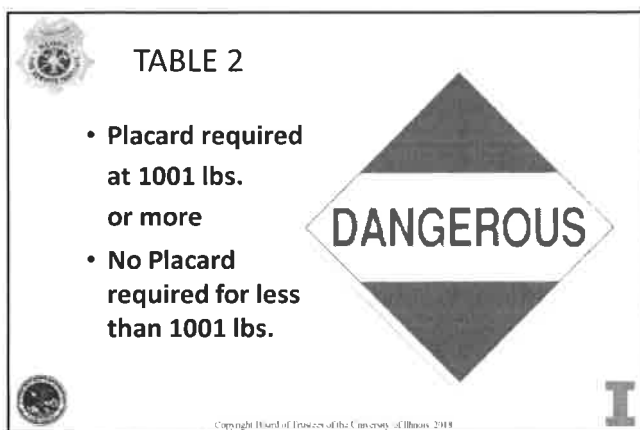
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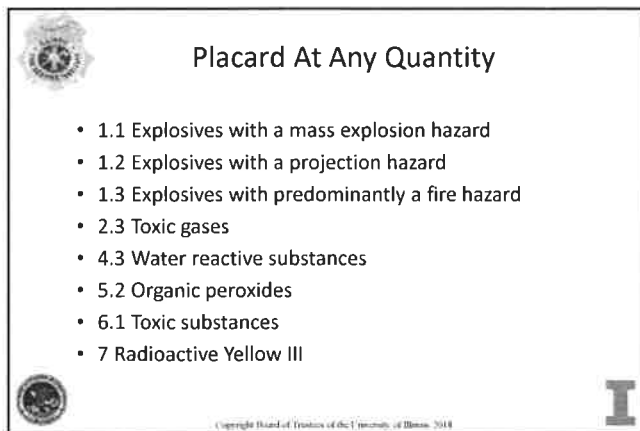
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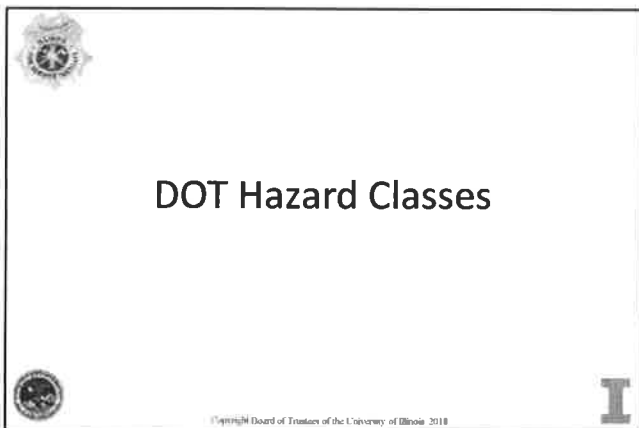
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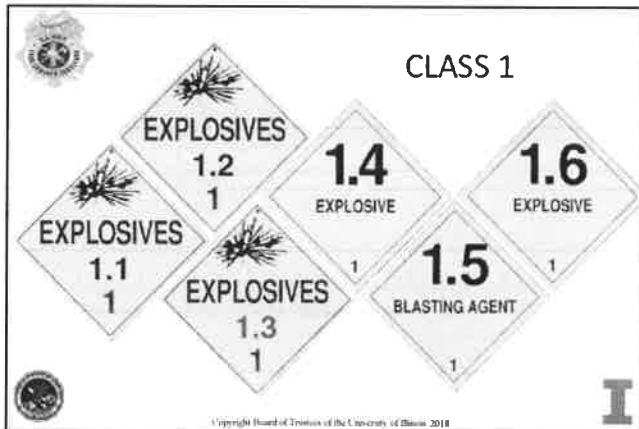
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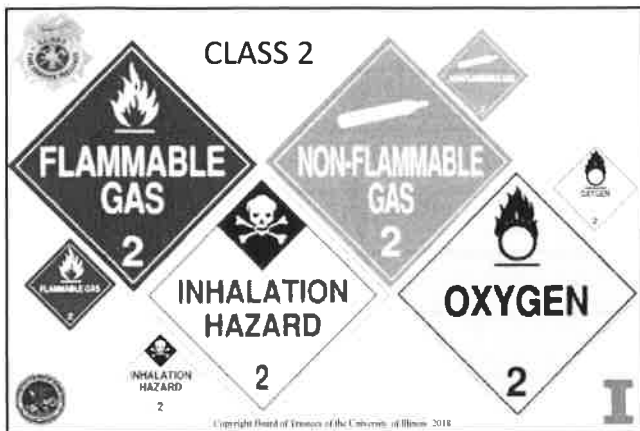
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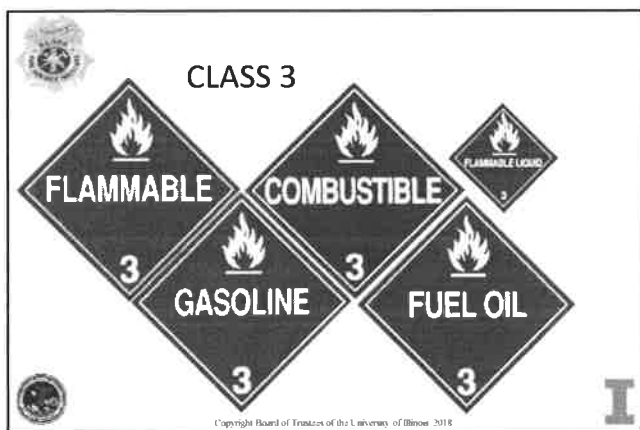
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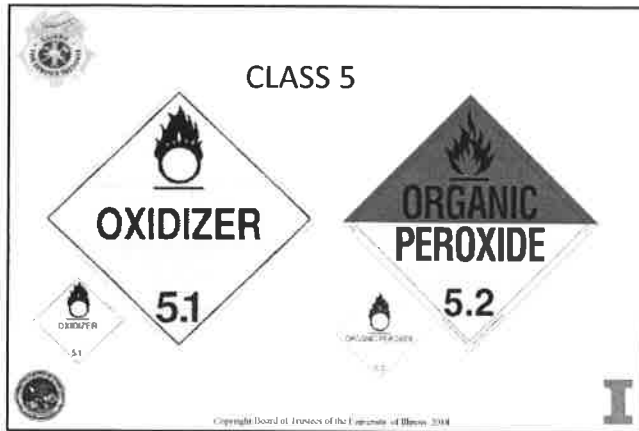
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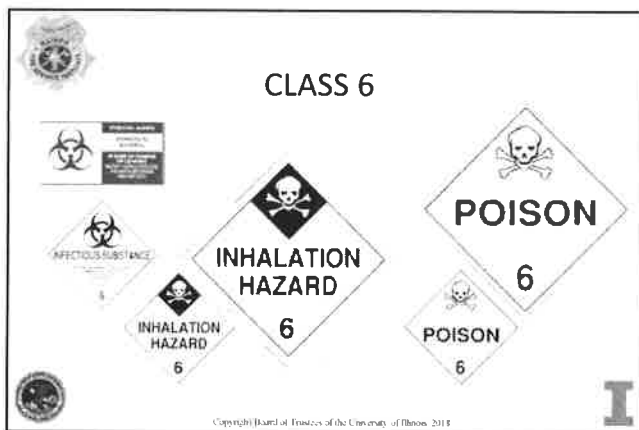
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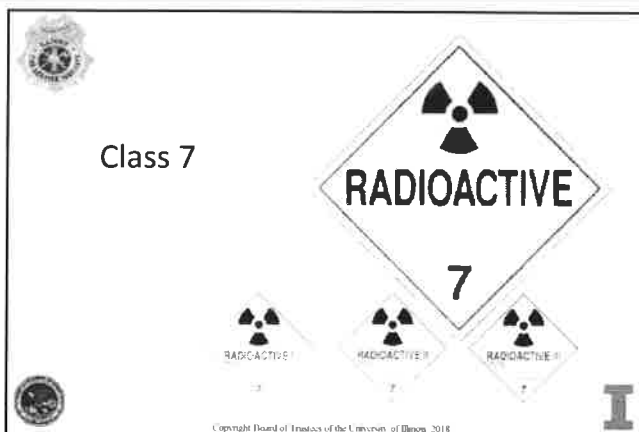
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 CLASS 8

  
**CORROSIVE**  
**8**

  
**CORROSIVE**  
**8**

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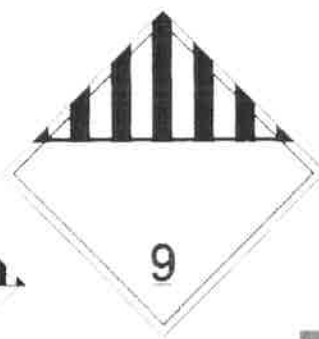
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 Class 9

  
**9**

  
**9**

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 Globally Harmonized System (GHS)

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## GHS Video

\*Single click below to play






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## Globally Harmonized System

OLD		NEW	
<p><b>Signal Words</b></p> <ul style="list-style-type: none"> <li>Extreme</li> <li>Very Dangerous</li> <li>Danger</li> <li>Warning</li> <li>Caution</li> <li>Notice</li> </ul>	<p><b>Signal Words</b></p> <ul style="list-style-type: none"> <li>Very Toxic</li> <li>Toxic</li> <li>Corrosive</li> <li>Flammable</li> <li>Explosive</li> <li>Highly Flammable</li> <li>Highly Explosive</li> <li>Very Flammable</li> <li>Flammable</li> <li>Very Irritant</li> <li>Irritant</li> <li>Very Harmful</li> <li>Harmful</li> <li>Very Dangerous</li> <li>Danger</li> <li>Warning</li> <li>Caution</li> <li>Notice</li> </ul>	<p><b>Signal Words</b></p> <ul style="list-style-type: none"> <li>Very Toxic</li> <li>Toxic</li> <li>Corrosive</li> <li>Flammable</li> <li>Explosive</li> <li>Highly Flammable</li> <li>Highly Explosive</li> <li>Very Flammable</li> <li>Flammable</li> <li>Very Irritant</li> <li>Irritant</li> <li>Very Harmful</li> <li>Harmful</li> <li>Very Dangerous</li> <li>Danger</li> <li>Warning</li> <li>Caution</li> <li>Notice</li> </ul>	<p><b>Signal Words</b></p> <ul style="list-style-type: none"> <li>Very Toxic</li> <li>Toxic</li> <li>Corrosive</li> <li>Flammable</li> <li>Explosive</li> <li>Highly Flammable</li> <li>Highly Explosive</li> <li>Very Flammable</li> <li>Flammable</li> <li>Very Irritant</li> <li>Irritant</li> <li>Very Harmful</li> <li>Harmful</li> <li>Very Dangerous</li> <li>Danger</li> <li>Warning</li> <li>Caution</li> <li>Notice</li> </ul>


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## Pesticide Labels

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## PESTICIDE LABELS

- Signal Word
  - Danger / Poison
  - High Toxicity
  - Warning
  - Moderate Toxicity
  - Caution
  - Low Toxicity

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## PESTICIDE LABELS

- Other Information
  - Statement of Practical Treatment
  - Physician or Chemical Hazard Statement
  - Product Name
  - Ingredient Statement

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## Emergency Response Guidebook SDS and Shipping Papers

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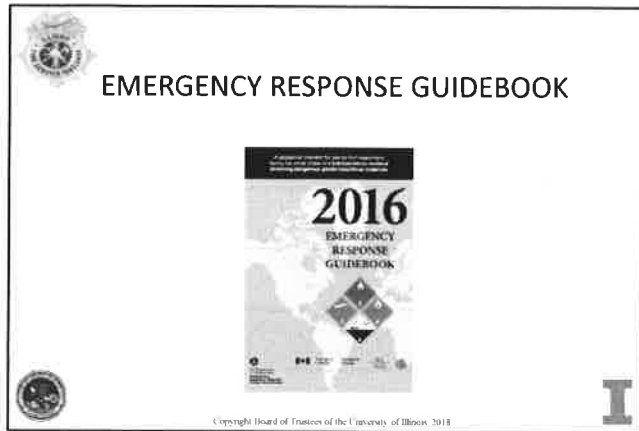
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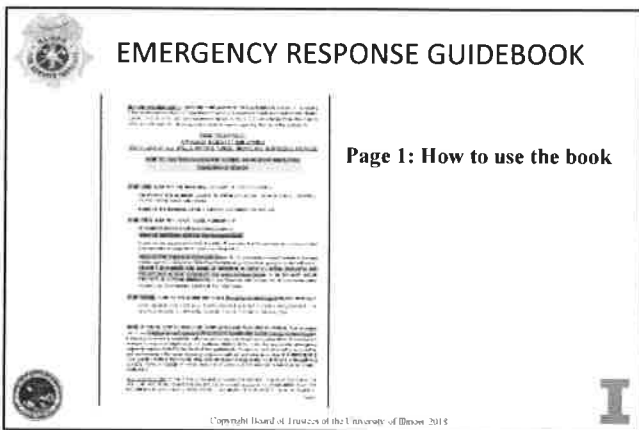
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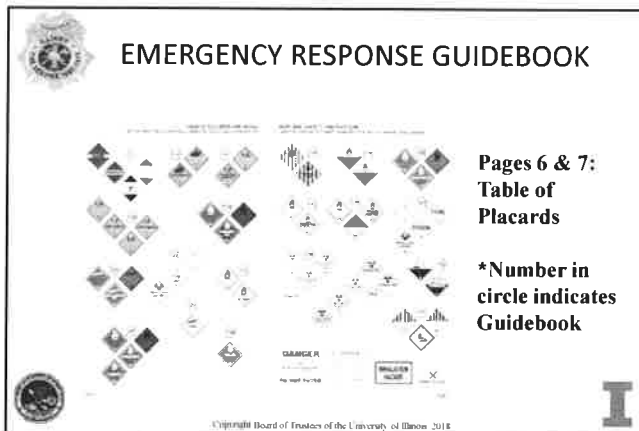
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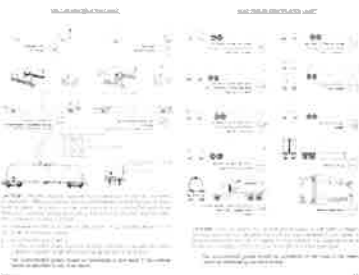
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# EMERGENCY RESPONSE GUIDEBOOK



**Pages 8 & 9:**  
**Container**  
**Identification**  
**Charts**

**\*Number in**  
**circle indicates**  
**Guidebook**

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# EMERGENCY RESPONSE GUIDEBOOK



**Yellow Section:**  
**Products by**  
**UN ID number**

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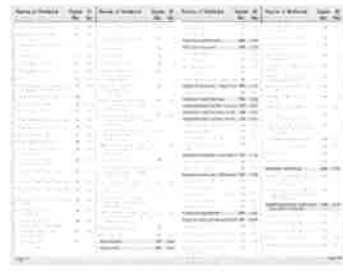
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# EMERGENCY RESPONSE GUIDEBOOK



**Blue Section:**  
**Products**  
**alphabetically**  
**by name**

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## EMERGENCY RESPONSE GUIDEBOOK



**Orange Section: Guidebooks**

**\*Potential Hazards Section: Greater hazard comes 1st**

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## EMERGENCY RESPONSE GUIDEBOOK

**Less than 55 Gal/208 Liters**



**Green Section: Initial Isolation and Protective Action Distances**

**\*Go to 1<sup>st</sup> for any product highlighted in Green**

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## EMERGENCY RESPONSE GUIDEBOOK

**Page 367: BLEVE Safety Precautions**



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## EMERGENCY RESPONSE GUIDEBOOK



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**Page 372:**  
**Improvised Explosive Device**  
**Safe Standoff Distances**

The Explosive (Device) System		Approximate Mass - 1 PISTOL (Approximate)	Approximate Mass - 1 RIFLE (Approximate)	Approximate Mass - 1 MORTAR (Approximate)
High Explosive (HE) Systems	Fragment Grenade	1.5 lbs	1.5 lbs	1.5 lbs
	Fragment Grenade	1.5 lbs	1.5 lbs	1.5 lbs
	Fragment Grenade	1.5 lbs	1.5 lbs	1.5 lbs
	Fragment Grenade	1.5 lbs	1.5 lbs	1.5 lbs
	Fragment Grenade	1.5 lbs	1.5 lbs	1.5 lbs
	Fragment Grenade	1.5 lbs	1.5 lbs	1.5 lbs
	Fragment Grenade	1.5 lbs	1.5 lbs	1.5 lbs
	Fragment Grenade	1.5 lbs	1.5 lbs	1.5 lbs
	Fragment Grenade	1.5 lbs	1.5 lbs	1.5 lbs
	Fragment Grenade	1.5 lbs	1.5 lbs	1.5 lbs
Low Explosive (LE) Systems	Fragment Grenade	1.5 lbs	1.5 lbs	1.5 lbs
	Fragment Grenade	1.5 lbs	1.5 lbs	1.5 lbs
	Fragment Grenade	1.5 lbs	1.5 lbs	1.5 lbs
	Fragment Grenade	1.5 lbs	1.5 lbs	1.5 lbs
	Fragment Grenade	1.5 lbs	1.5 lbs	1.5 lbs
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	Fragment Grenade	1.5 lbs	1.5 lbs	1.5 lbs

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## Safety Data Sheets (SDS)



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## Safety Data Sheets (SDS)



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**Safety Data Sheet - Required Sections**

- Identification of the substance and the supplier
- Hazards identification
- Composition/information on ingredients
- First aid measures
- Firefighting measures
- Accidental release measures
- Handling and storage

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## Safety Data Sheets (SDS)

### Safety Data Sheet - Required Sections

- Exposure controls/personal protection
- Physical and chemical properties
- Stability and reactivity
- Toxicological information
- Other information (including date of preparation)



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## Safety Data Sheets (SDS)

### Safety Data Sheet – Non-mandatory Sections

- Ecological information
- Disposal considerations
- Transport information
- Regulatory information
- Since other agencies regulate this information, OSHA does not enforce it



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## SHIPPING PAPERS

### IDENTIFICATION OF SHIPPING PAPERS

MODE OF TRANSPORT	TITLE OF SHIPPING PAPER	LOCATION OF SHIPPING PAPER	PERSON(S) RESPONSIBLE
HIGHWAY	Bill of Lading	Cab of Vehicle	Driver
RAIL	Way bill Consist	A Crew Member	Train Crew Member
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



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## Information Contained on Shipping Papers

- Proper shipping name
- UN Hazard Class
- 4 DIGIT UN/NA identification Number (DOT ID #)
- Emergency contact phone number
- Shipper's and Consignee's (receiver's) name and address
- Means of indicating or highlighting presence of hazardous materials



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## Other Sources of Information

- IEMA (800-782-7860)
- CHEMTREC (800-424-9300)
- PERS (800-728-2482)
- INFOTRAC (800-535-5053)
- NATIONAL RESPONSE CENTER (800-424-8802)



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## Monitoring Devices

- Using monitoring equipment to determine the presence of hazardous materials should only be attempted by properly trained individuals
- Usually beyond the Awareness level



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## Senses

- **Sight and sound should be the only senses employed intentionally at a hazardous materials incident!**
- **Caution - If you can smell, taste, or feel it.  
You are in it!**



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## Information Obtained by Senses

- **Bystander reports**
- **Odors or reports of odors**
- **Gas Leaks, frosted valving, hissing**
- **Vapor clouds, pooled products**
- **Dead animals, plants or persons**
- **Relief device operation**
- **Unusual fire conditions including smoke color, behavior**



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## Module 3 Summary



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## OSHA Hazardous Materials Awareness

### Module 4: Basic Scene Decisions



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### Before Emergency Responders Arrive

- Maintain a safe distance
- Note any changes in the scene
- Keep up-to-date with what is happening
- Remember it is not your responsibility to control or contain the hazardous material spill



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### Overall Strategies

- Non-Intervention
- Defensive Tactics
- Offensive Tactics



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### Strategic Priorities

- Safety
- Rescue
- Product Control
- Environmental Protection & Control
- Property Protection & Conservation




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### 5 Step Process

- Isolate
- Identify
- Notify
- Mitigate
- Terminate

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### Isolate

- Approach from UPHILL and UPWIND
- Set-up staging area
- Start evacuation (if appropriate)
- Notification as soon as possible

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## Approaching the Scene Video

\*Single click below to play





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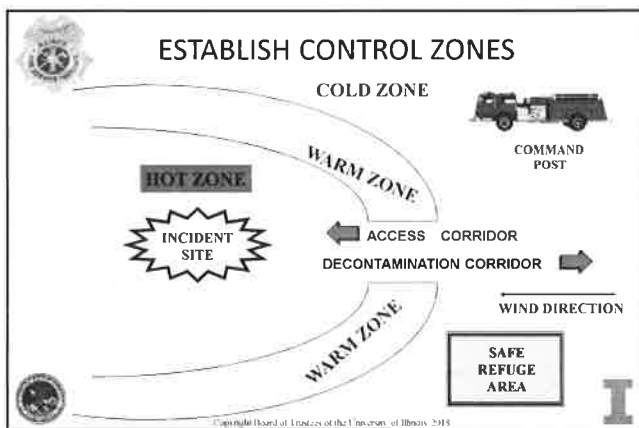
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## Identify

- Use clues from Module 3
- Senses permit you to visualize (sight) and listen (sound) for changing conditions and other important clues

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## Notify

- Make initial notifications through established emergency response plan
- Relay pertinent information

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## Information to be relayed

- Who are you? Who is involved? Are there people exposed?
- What has happened? What Hazmats are involved?
- When did the event occur?
- Where are you? Where is the scene?

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## Mitigate

If you or other responders are only trained to the Awareness Level, the mitigation strategy of choice should be non-intervention

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## Terminate

- Documentation
- Debriefing
  - Important due to the stress encountered during the incident
- Critique



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## Questions?



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