Appendix 1

SUMMARY

Definitions, Terms, Illustrations, Review materials

Chemical and Physical properties: Definitions

Boiling Point: The temperature at which a liquid will continually give off vapors in sustained amounts and, if held at that temperature long enough, will turn completely into a gas.

Chemical reactivity: The ability of a substance to undergo a transformation at the molecular level, usually with the release of some form of energy.

Corrosivity (pH): The ability of a material to cause damage (on contact) to skin, eyes, or other parts of the body.

Flammable (explosive) range [lower explosive limits (lel) and upper explosive limits (uel)]: An expression of a fuel/ air mixture, defined by upper and lower limits, that reflects the amount of flammable vapor mixed with a given volume of air.

Flash Point: The expression of the minimum temperature at which a liquid or solid gives off sufficient vapors that, when an ignition source is present, the vapors will result in a flash fire.

Ignition (auto-ignition) temperature: The minimum temperature at which a fuel, when heated, will ignite in air and continue to burn.

Particle size: a notion introduced for comparing dimensions of solid particles (*flecks*), liquid particles (*droplets*), or gaseous particles (*bubbles*).

Persistence: Continuance of a chemical effect after the cause has been removed.

Radiation (ionizing): Any radiation, as a stream alpha particles or x-rays, that produces ionization as it passes through a medium.

Radiation (nonionizing): Any type of electromagnetic radiation that does not carry enough energy per quantum to ionize atoms or molecules—that is, to completely remove an electron from an atom or molecule.

Specific Gravity: The ratio of the density of any substance to the density of some other substance taken as a standard, water being the standard for liquids and solids, and hydrogen or air being the standard for gases.

Toxic Products of Combustion: The hazardous chemical compounds released when a material decomposes under heat.

Vapor Density: The weight of an airborne concentration of a vapor or gas as compared to an equal volume of dry air.

Vapor Pressure: The pressure exerted by the molecules of a vapor, especially that part of the total pressure exerted by vapor in a mixture of gases, as by water vapor in air.

Water Solubility: The ability of a substance to dissolve in water.

Highly Toxic: A **highly toxic** material is defined by the U.S. Occupational Health and Safety Administration (OSHA) as a chemical that falls in any of these three categories:

1. A chemical that has a median lethal dose (LD_{50}) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.
2. A chemical that has a median lethal dose (LD_{50}) of 200 milligrams or less per kilogram of body weight when

administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each.

3. A chemical that has a median lethal concentration (LC_{50}) in air of 200 parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

Evidence Preservation in Hazardous Materials Response: the Process

1. Secure and isolate any incident area where evidence is located.
2. Leave fatalities and body parts in place and secure the area in which they are located.
3. Isolate any apparent source location of the event (e.g. blast area, spill release point).
4. Leave in place any explosive components or housing materials.
5. Place light-colored tarpaulins on the ground of access and exit corridors, decontamination zones, treatment areas, and rehab. Sectors to allow possible evidence that might drop during decontamination and doffing of clothes to be spotted and collected.
6. Secure and isolate all food vending locations in the immediate area. Contaminated food products will qualify as primary or secondary evidence in the event of a chemical or biological event.

Use of Medical Care

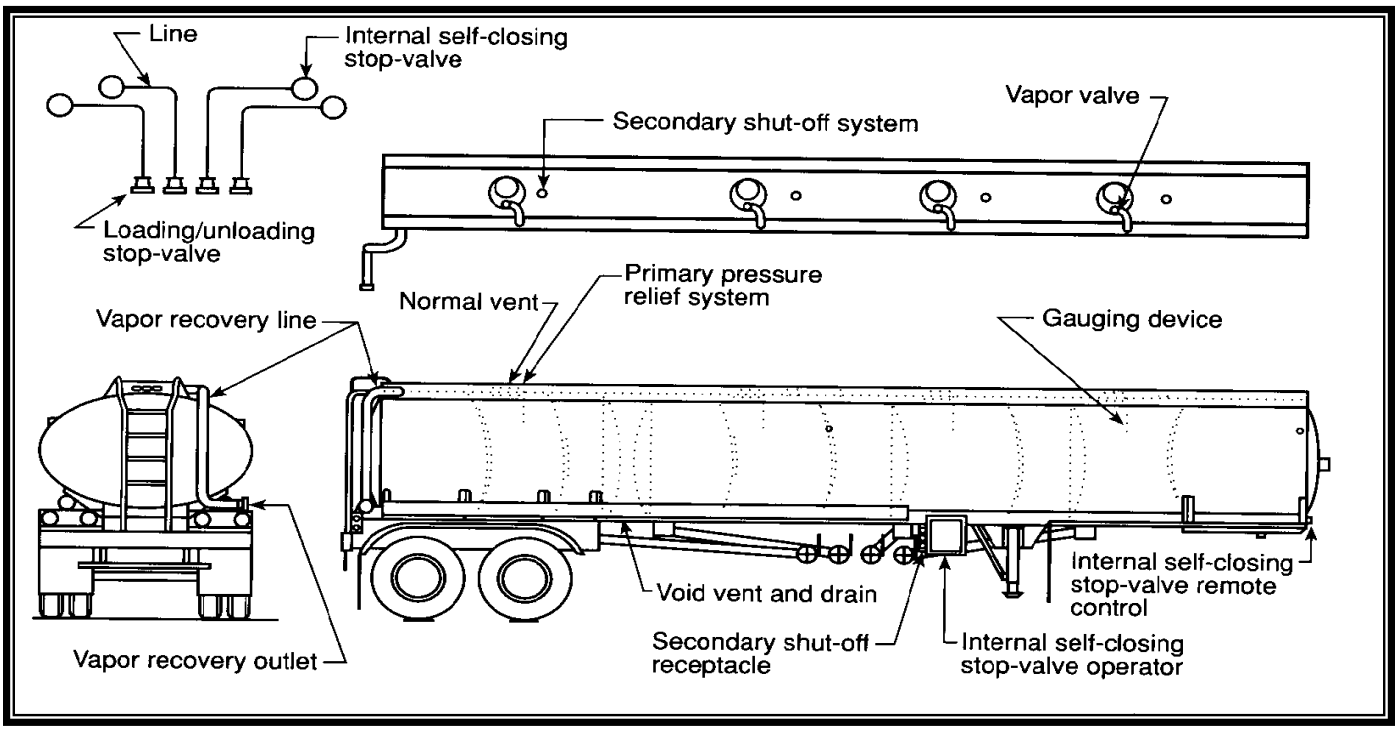
The best thing that can be done for victims in a hazardous atmosphere is to remove them from the environment, ensure that they have been properly decontaminated, and given the appropriate medical care available. This will occur outside of the hot and warm zones.

There are no absolutes in the delivery of medical care. In some extreme situations, medical care may be delivered in the hot or warm zones. At the core operations level, **this is not an option**. However in **mission specific operations competencies,** the following is a consideration:

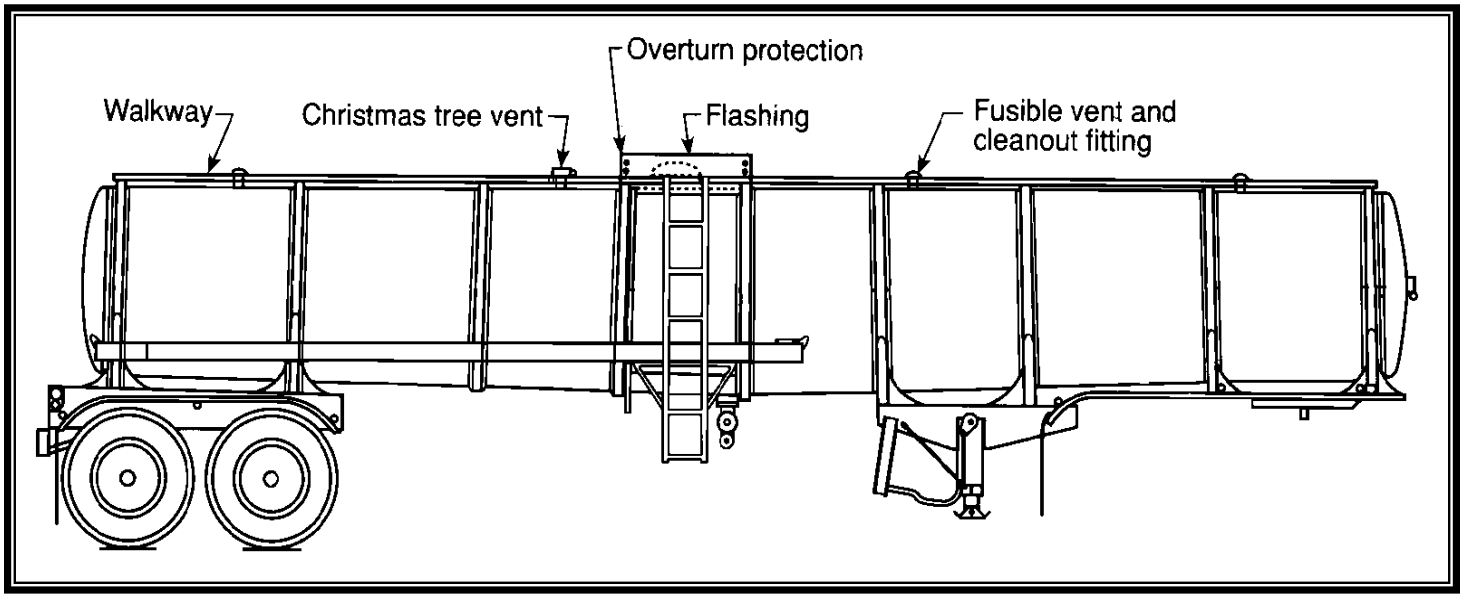
In some extreme and unusual cases, medical care may need to be delivered in the warm or hot zone prior to or concurrent with decontamination. In those situations, hazardous materials responders and medical personnel must balance the need for performing life-saving interventions with the need for ensuring decontamination. This decision is made on a case by case basis, with consideration being given to the nature and severity of the incident, the medical needs of the patient, and the need to perform decontamination prior to rendering care.

HAZMAT Operations REVIEW Images

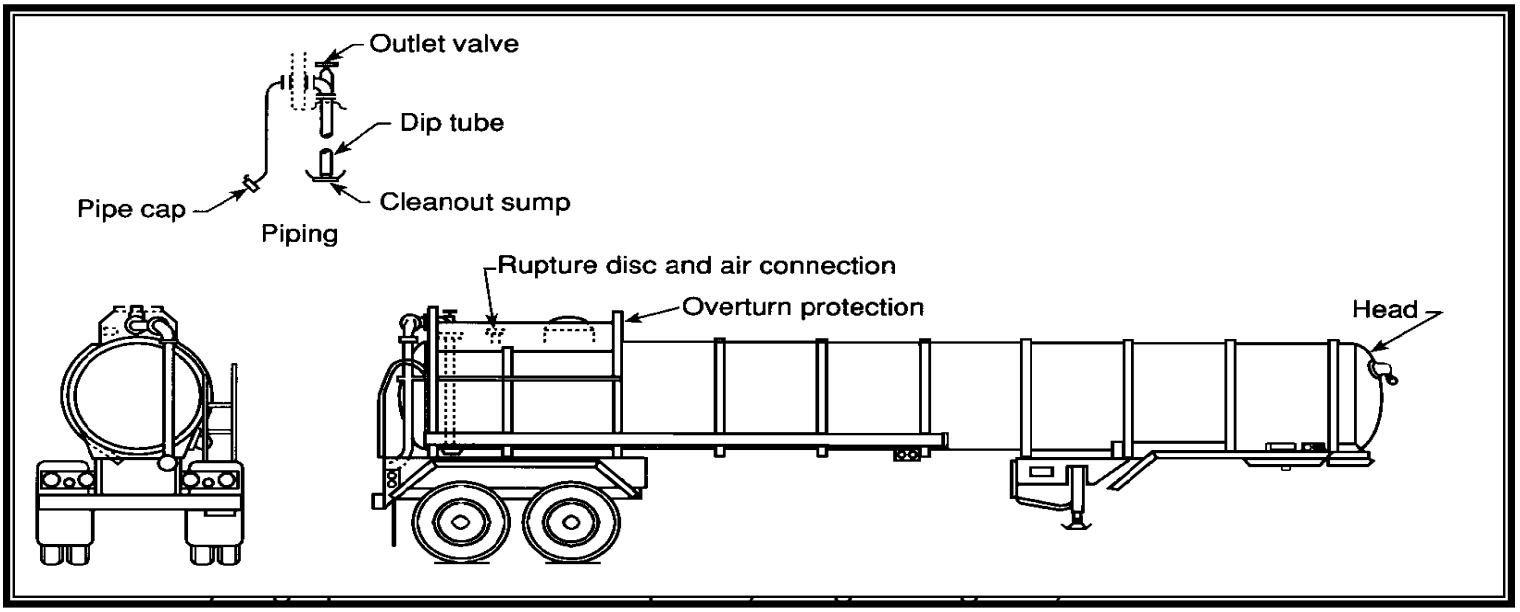
306 / 406 3psi petroleum products, 9,000 gallons flammable and combustible liquids



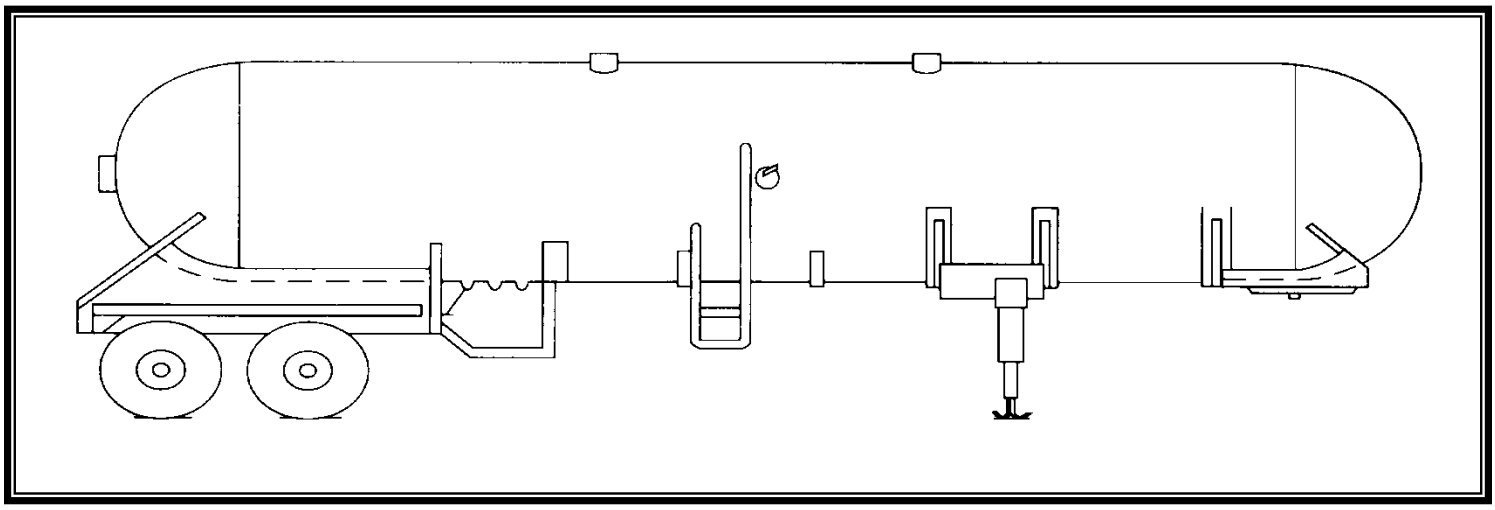
307/407, 40 psi, 6,000-7,000 gal flammable/comb. Poisons, Mild Corrosives



312/412 Corrosive cargo 5,000-6,000 gals corrosives and high density liquids

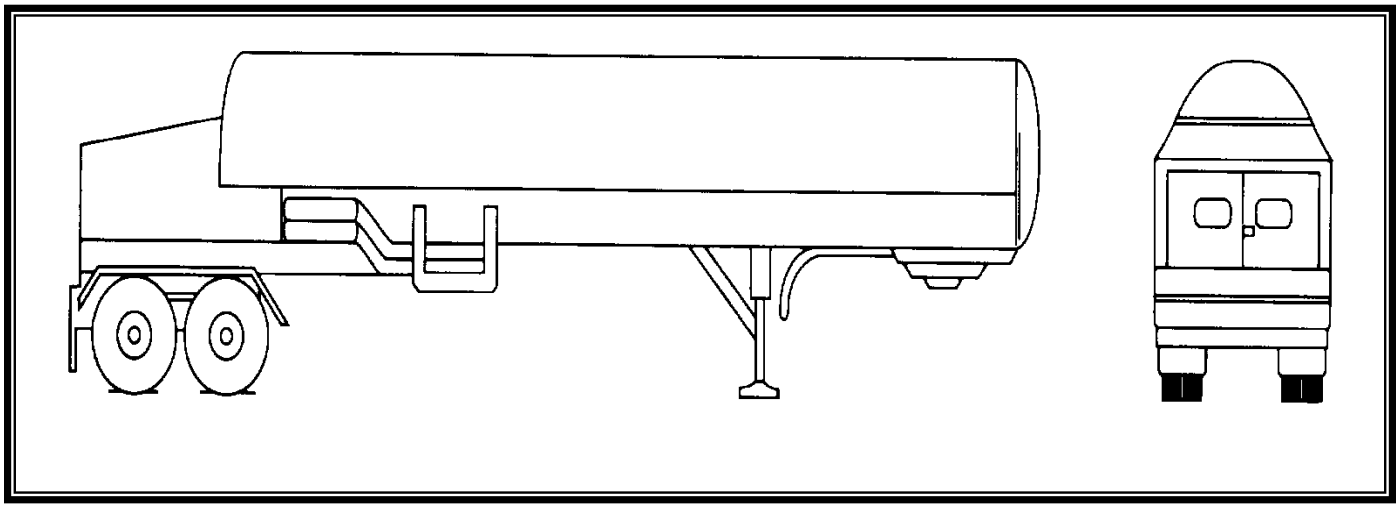


anhydrous ammonia

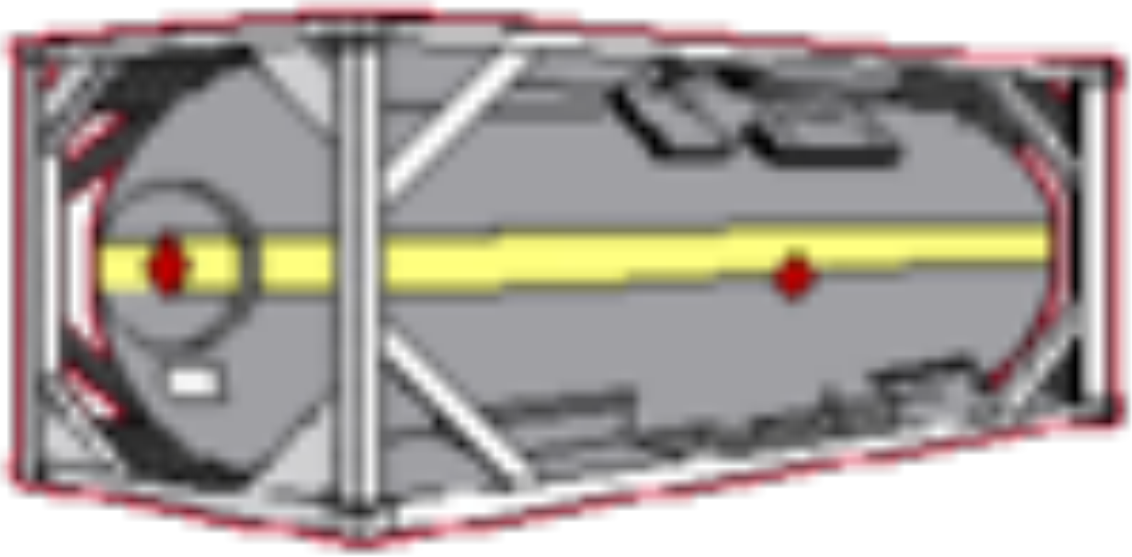


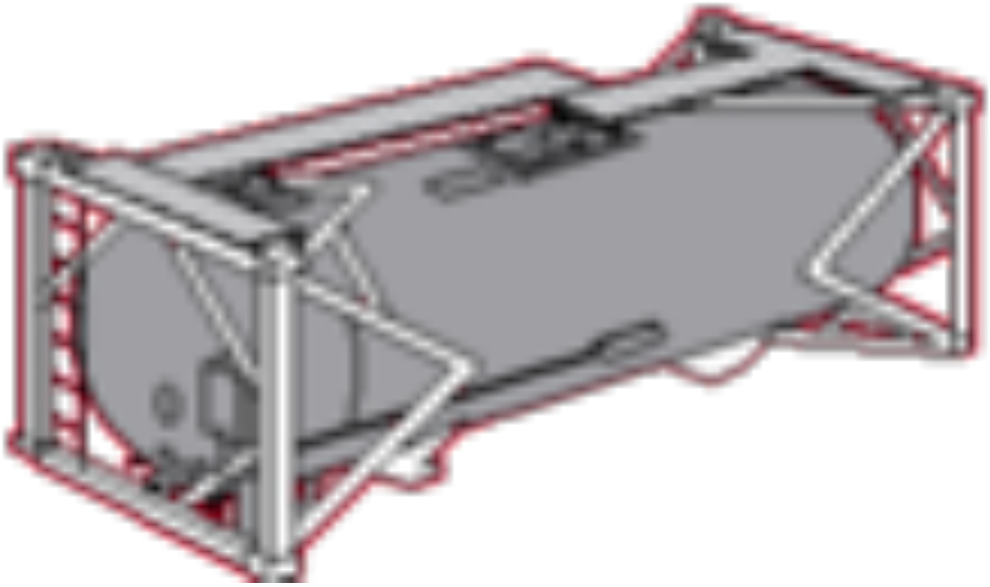
338 cryogenic 25psi, -155 degrees, liquid argon, nitrogen,

oxygen.



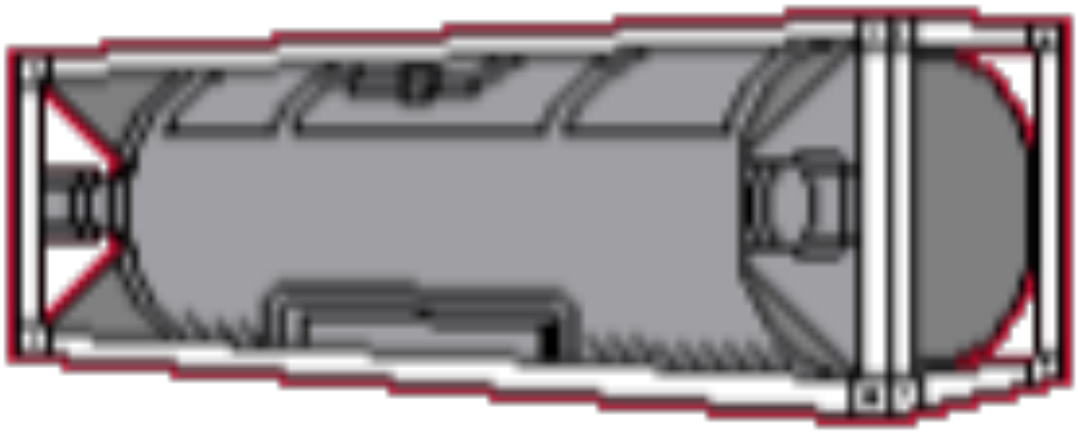
IMO Type 1 or 2 Non-Pressure





IMO Type 7 Cryogenic (Tank within a tank description)

Tank within a Tank design

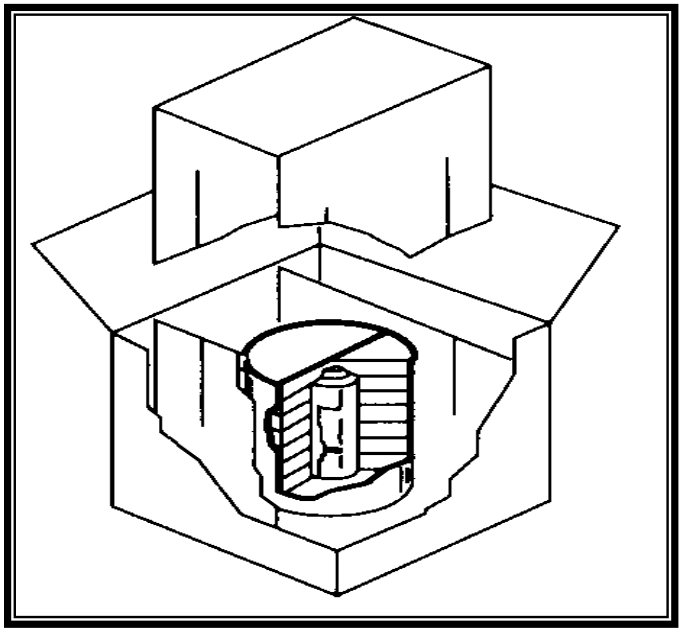


Radioactive - Type A, (Excepted) Cardboard boxes, wooden crates, cylinders, and metal drums.

Type A packages transport materials with relatively high specific activity levels such as radioactive materials for medical use or certain industrial products like density gauges.

Material examples:

- Radiopharmaceuticals (radioactive materials for medical use)
- Certain regulatory qualified industrial products

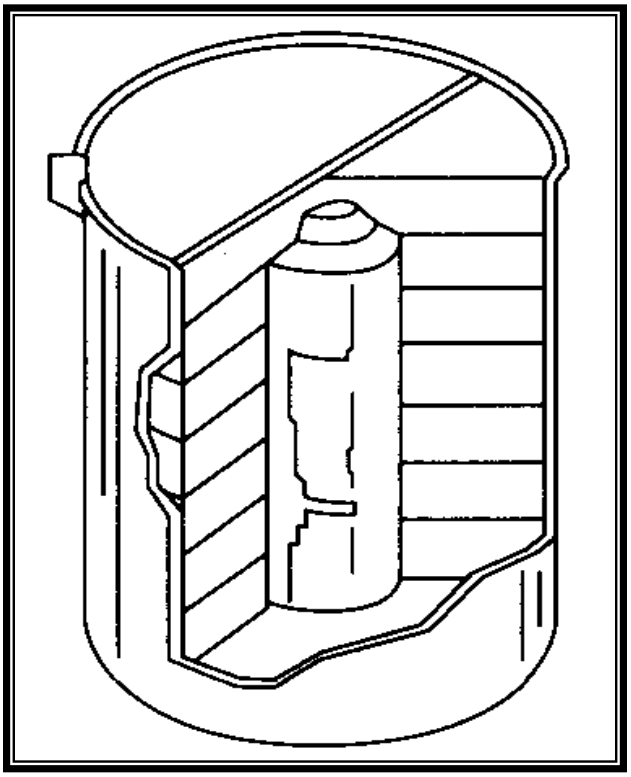


Radioactive Type B (Industrial), Steel reinforced concrete casks. Lead pipes, Heavy-gage large metal drums transported on Flat Trailer

Type B packages are designed to withstand severe conditions. Type B packages contain materials with high levels of radioactivity that would present a radiation hazard to the public or the environment if there were a major release.

Material examples:

- Materials that would present a radiation hazard to the public or the environment if there were a major release
- Materials with high levels of radioactivity such as spent fuel from nuclear power plants

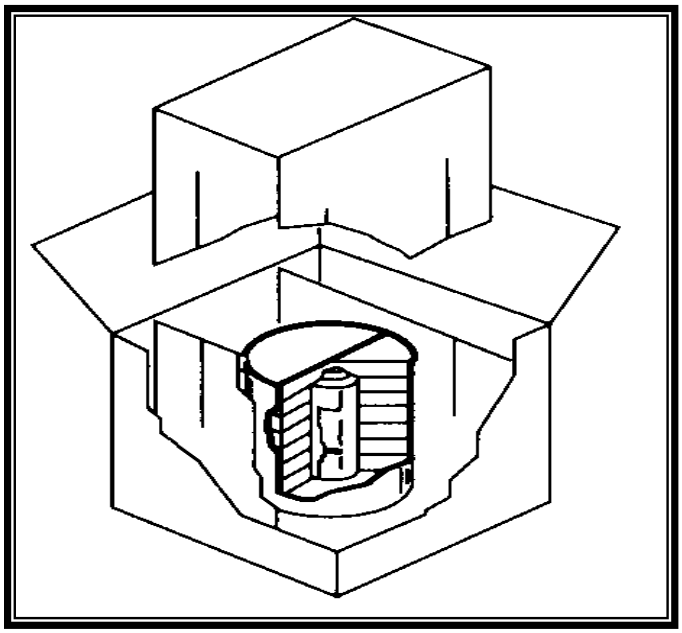


Radioactive - Type C (Industrial), Specially designed packaging that has performance requirements that are significantly more stringent than those for Type B packaging.

Type B packages are designed to withstand severe accident conditions associated with air transport. Type C packages are very rare, and first responders are unlikely to encounter them.

Material example:

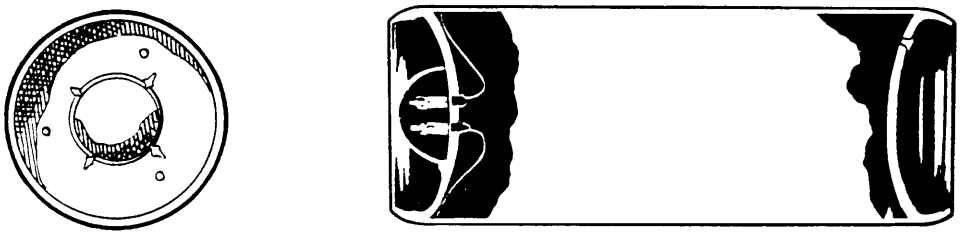
- Plutonium



Ton Containers - Cylindrical pressure tanks approximately 3 feet in diameter and 8 feet long with convex or concave heads. All fittings are in the heads, including fusible plugs and/ or spring loaded safety relief valves.

It gets it's name from the package's capability to transport 1 ton of chlorine.

Ton containers have 2 valves; 1 for vapor and 1 for liquid.



Ton Containers

Radioactive placarding with Transportation Index (TI).

TI is the highest amount of radiation detected 1 meter away from the package [1(lowest) to 3(highest)].

Military Markings: Images

Mass Detonation

Explosive with fragment hazards

Mass Fire Hazard

Moderate Fire Hazard

Red exterior circle

(toxic agents)

Yellow exterior circle

(harassing agents)

White exterior circle

(white phosphorus)

Summary Sheet for Containers

Type		Pressures	Capacity	Common Products Carried
Fixed				
	Atmospheric	0 – 0.5 psi	Various	Horizontal, ordinary cone roof, floating roof, lifter roof, and vapor dome roof tanks
	Pressurized: Low pressure	0.5 – 15 psi	various	Pressure vessel, spheroid, sphere,
	Pressure	+ 15 psi	various	noded spheroid
	Cryogenic liquid	Non pressure	various	Refrigerated commodities: carbon dioxide, nitrogen, argon, hydrogen, and oxygen
Rail				
	Non-Pressure	35 - 100 psi	4000 – 45000 gal	HAZMAT: flammable and combustible liquids, flammable solids, oxidizers, organic peroxides, poison B materials, corrosive materials,

				molten solids, and certain flammable and non-flaming gases. NON-HAZMAT: tallow, fruit and vegetable juices, tomato paste, and caramel
	Pressure	100 – 600 psi	4000 – 45000 gal	HAZMAT: flammable and non-flammable poisonous gases at higher pressures, ethylene oxide, pyrophoric liquids, sodium metal, motor fuel anti-knock compounds, bromine, anhydrous hydrofluoric acid, acrolein
	Cryogenic liquid	25 psi or lower (-155 degrees or below)		Liquid argon, ethylene, hydrogen, nitrogen, oxygen
IM (Intermodal)				
	Non-Pressure: IM 101	Up to 100 psi MAWP	5000 – 6300 gal	Transports hazardous and nonhazardous materials, including toxic, corrosives, and

				flammables with flash points below 32 degrees F
	IM 102	14.5 – 24.4 psi	5000 – 6300 gal	Transport materials such as whiskey, alcohols, some corrosives, pesticides, insecticides, resins, industrial solvents, flammables with flash points ranging from 32 degrees F to 140 degrees F. May also carry food grade commodities
	Pressure: DOD Spec. 51 port. tank	100 – 500 psi	4500 – 5500 gal (but not as small as 50 gal)	Transports gases liquefied under pressures: LP gas and anhydrous ammonia.
Road Trailers				
	MC 306/ DOT 406	>3 psi	9000 gal	Single shell, aluminum construction transports petroleum products
	MC 307/ DOT 407		6000 – 7000 gal	Circular cross section, double shell

				construction transports flammable and combustible liquids, poisons
	MC 312/ DOT 412	Up to 40 psi	5000 – 6000 gal	Circular cross section, smaller diameter with external reinforcing ribs often visible, overturn and splash protection at dome cover/ valve locations transports corrosives
	MC 331	Not < 100 psi or > 500 psi	2500 – 11500 gal	Circular cross section w/ round ends transports LP gases and anhydrous ammonia
	MC 338 (Cryogenic Liq. Tanks)	Operating pressure: 22 psi		Well insulated "thermos bottle" design, double shell with relief protection, vapors will normally discharge. Transports cryogenic liquids, liquid oxygen, liquid nitrogen, liquid argon, and liquid carbon dioxide

	Compressed Gas (tube) trailers	3000 – 5000 psi		Cylinders are stacked and manifolded together transports compressed, such as oxygen, nitrogen, and hydrogen
	Pneumatically off-loaded hopper trailers (dry bulk hoppers)		Up to 1500 cubic ft	Carry very heavy loads, centrifugal force cause of many rollovers, uses air pressure for product transfer, static charges are a common hazard transport ammonium nitrate fertilizer, cement, dry caustic soda, plastic pellets. Sometimes will carry liquids

Types of Tank Car Damages and Interpretations

Damage	Appearance	Cause	Major Concerns
Crack	Narrow break or opening	Application of mechanical force; inward deformation	Any cracks that extend into base metal, either accompanied by an increase in pressure or in conjunction with dents, scores, or gouges
Dent	Deformation of Tank Head or Shell	Impact with relatively blunt object	Sharp radius of curvature- *before 1964*; 4 inches, *after 1967*, 2 inches. Dents and gouges or scores that cross a weld
Score	Reduction in thickness of the Tank Shell or Head; has ridges of displaced metal along its side; relatively round bottom	Impact with relatively blunt object	Depth of indention Cross welds and - Remove base metal - Into heat-effected zone Direction of score Length of score
Gouge	Reduction of thickness of the Tank Shell or Head; metal cut out	Impact with sharp chisel-like object	Depth of indention Cross welds and - Remove base metal - Into heat-effected zone Direction of score Length of score
Wheel Burn	Reduction of thickness; spot burn; has ridges of displaced metal	Turning wheel in contact with tank for considerable distance	Depth of indention Cross welds and - Remove base metal - Into heat-effected zone Complicated by displaced metal
Rail Burn	Long inward dent with	Contact with rail or	Depth of indention

	gouge, typically crosses welds	other stationary object (wheel flange)	Sharp dents Cross welds and - Remove base metal - Into heat-effected zone Direction of rail Burn Length of score

Five (5) Types of Container Breaches

1. Disintegration
2. Run-away cracking
3. Closures opening up
4. Punctures
5. Splits or Tears

Four (4) Ways Containers Release Their Contents

1. Detonation
2. Violent Rupture
3. Rapid Relief
4. Spill or Leak

Dispersion Patterns created upon Hazardous Materials Release

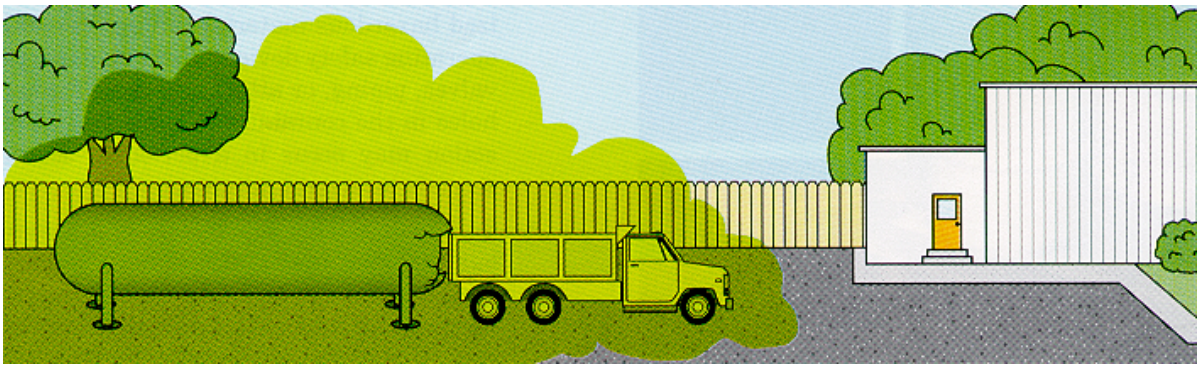
There are different factors influencing dispersion patterns. They are the amount of the material, the form of the material (solid, liquid, or gas), the weather conditions, the topography, the type of container breach, and the type of release.

Once a container has breached and the material released, it will distribute over the surrounding area in pattern.

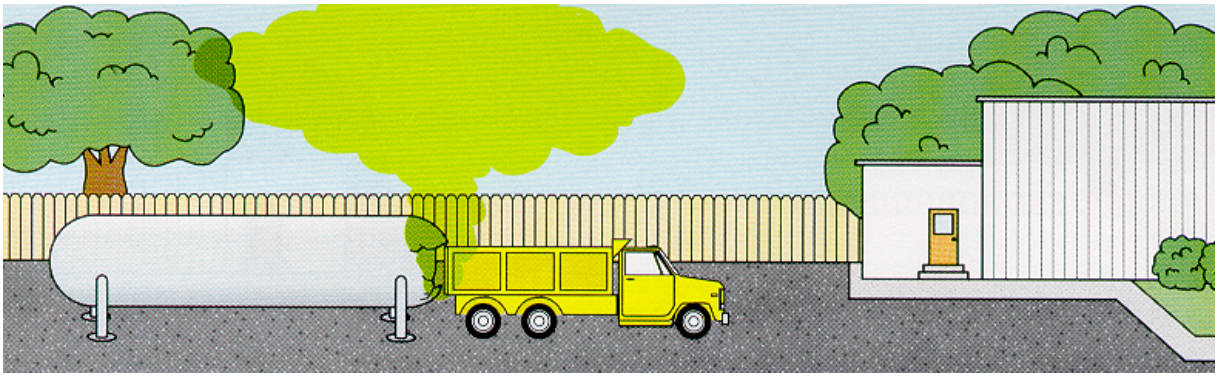
These patterns, sometimes called “footprints,” are the outline of the dispersing material.

The seven types of dispersions patterns are:

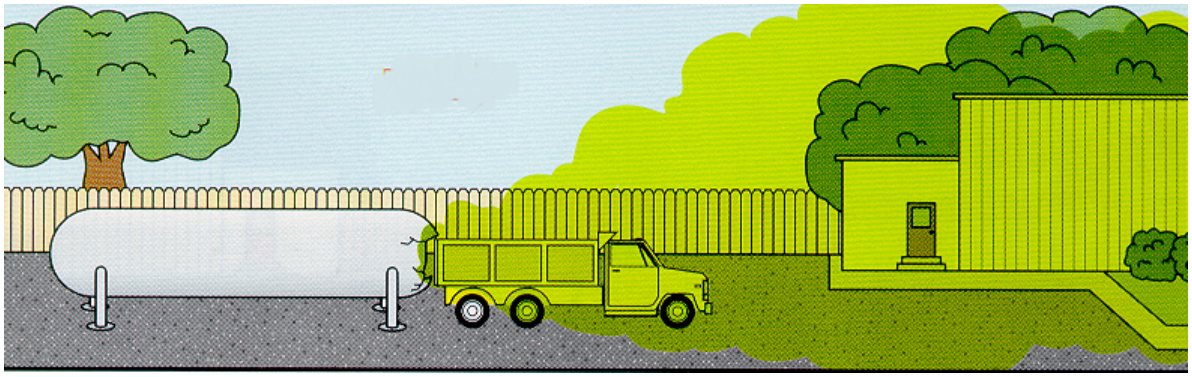
1. **Hemispheric**:
   - A semicircular or dome-shaped pattern of the airborne hazardous material.
   - Gas or aerosol releases.



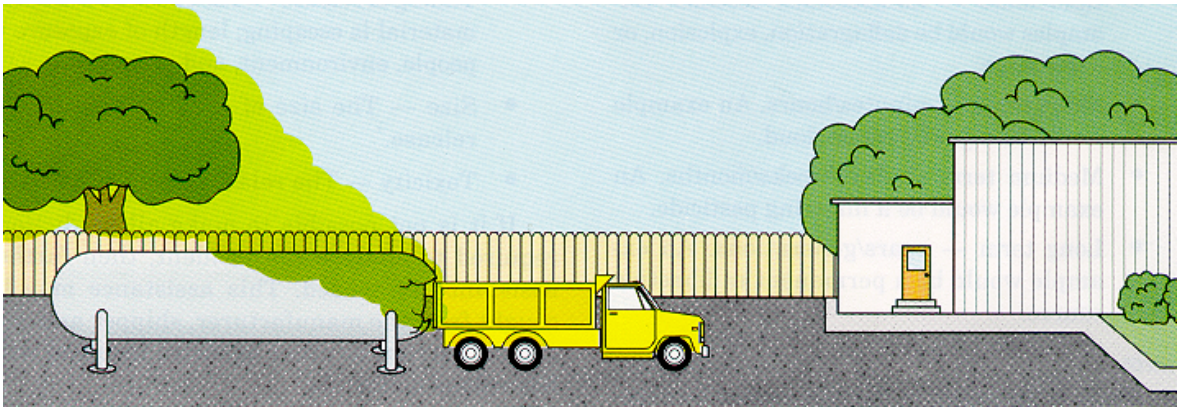
2. **Cloud**:
    - Ball-shaped pattern of the airborne hazardous material where the material has collectively risen above the surface.
    - Gas or aerosol releases.



3. **Plume**:
    - An irregularly shaped pattern of the airborne hazardous material where wind and/or topography influence the downrange course from the point of release.
    - Gas or aerosol releases.

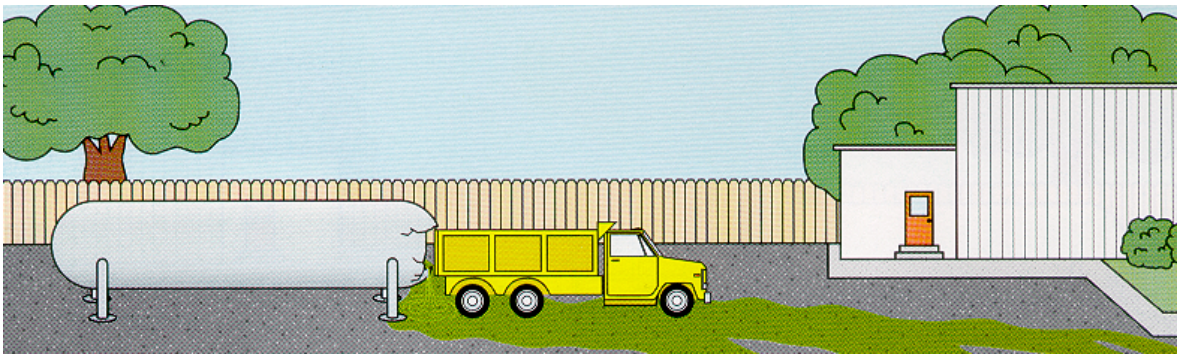


4. **Cone**:
    - A triangular-shaped pattern of the airborne hazardous material with a point source at the breach and a wide base downrange.
    - Gas or aerosol releases.

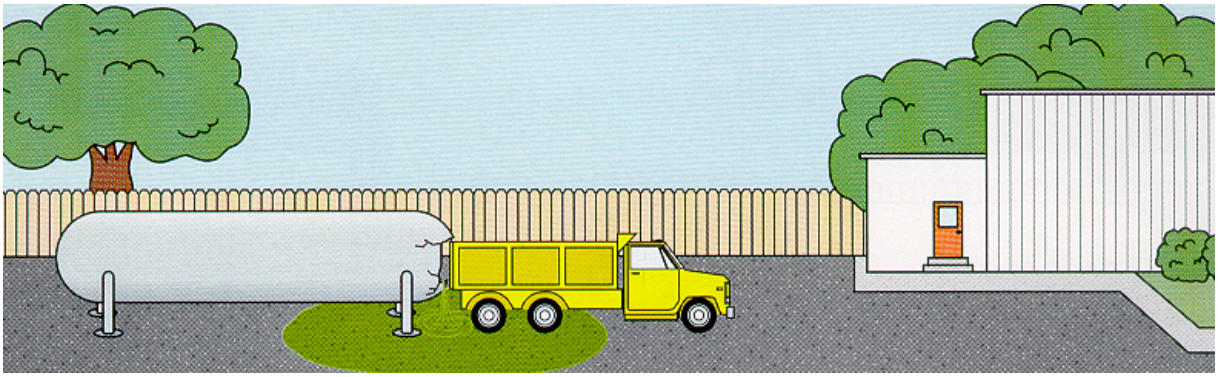


5. **Stream**:

    - Surface-following pattern of liquid hazardous material affected by gravity and topographical contours.
    - Liquid releases.



5. **Pool**:
    - A flat and circle-shaped pattern of the hazardous material on the surface of the ground or on water.
    - Liquid or solid releases.



6. **Irregular**:
    - An irregular or indiscriminate deposit or pattern of the hazardous material.
    - Liquid or solid releases.

(no graphic for this type of dispersion pattern)

Review Questions

What 2 regulations are identical (say the same thing)?

OSHA 29CFR1910.120 and EPA 40 CFR 311

Carboys commonly contain? **Corrosives**

Ordinary cone roof storage tanks contain _____ liquids.

Low volatile

Floating roof storage tanks contain _____ liquids.

Highly volatile

Radioactive Cask that is steel / lead pipe in reinforced concrete.

Type B

A rail car that is stenciled with a chemicals proper shipping name is a?
Dedicated Car

Gases that displace O2, such as Carbon dioxide & Nitrogen are examples of _____ asphyxiants**.** **Simple**

“Initial isolation distance” of the incident is found in? **ERG**

A noninsulated, single-shell vessel, which carries gases that have been liquefied, is? **MC 331**

A substance that releases ionizing particles is DOT Hazard Class_____.
7

The amount of an ingested, absorbed, or injected substance that results in the death of 50% of the test population: **LD50**

The first tactical priority to consider during a hazmat incident?

Exposure Protection

If you are using H2O to extinguish a fire involving pesticides or a poison, responders primary concern is: **Contaminated Run-off**

Removal of contaminated victims that are in need of medical treatment from the hazard area requires:

Emergency Decontamination

What is the primary hazard to the responders while rescuing victims in a building where a non-flammable Hazard Class 2 product is leaking? **Inhalation, Asphyxiation**

When determining the type of dam to use to control a spill, responders need to consider the: **specific gravity of the material**

_____ is comprised of those procedures taken to keep a material in a defined or local area. **Confinement**

Defensive control techniques that operations level personnel are permitted to engage in: **Damming, Diking, Diversion, Retention**

The most common route of exposure to responders: **Inhalation**

Type of breathing system that cannot be utilized in an O2 deficient atmosphere? **APR (air-purification respirator)**

The minimum level of respitory protection for responders engaged in emergency response to an unknown substance: **SCBA**

Highest level of respitory protection and chemical protection:

Level A

Highest level of respitory protection but a lesser chemical protection:
Level B

Represents the highest degree of hazard in the NFPA 704 system: **4**

The area that responders move the victims that are in the hot zone while awaiting to be decontaminated: **Safe Haven / Safe Refuge**

If the responders normal route of travel takes the responders though the hot zone, the responders should: **Take another route even if it takes them longer.**

Materials that ignite when exposed to air: **phyrophoric**

270:1 represents: **Expansion ratio**

Lithium, magnesium, titanium, sodium: **water reactive material**

Gross decontamination is done in the: **Hot Zone**

Substance that changes your DNA and the DNA of the rest of your family line? **Mutagen**

Substance that causes a one-time birth defect: **Teratogen**

Airborne concentration that workers can be exposed to day after day without any adverse health effects: **TLV/TWA**

Emergency decontamination removes the threat of secondary contamination: **False: it does not**

The zone where contamination has occurred or has the potential to occur: **Hot / Exclusion Zone**

Prior the allowing the responders to act they should be briefed on how to plug a leak: **False, they should already know how to plug a leak**

What should responders do with the run-off from the emergency decon: **divert it to an area where it can be treated or disposed of later**

What are the 5 major functions within the ICS system: **Command, Operations, Planning, Logistics, Finance**

Symptoms: Hot, dry, red skin, deep then shallow breathing, rapid pulse: **Heat Stroke**

Back-up personnel should be located in the: **Cold Zone**

Diversion, diking, retention are _____ techniques. **Confinement**

An advantage of confinement operations is: **Direct exposure of personnel is avoided**

The action taken to direct or influence the course of airborne hazards is called: **vapor dispersion**

Cargo truck carrying explosives that are on fire, the responders shall: **Immediately evacuate the area**

The sound that is often heard when metal has been softened/stressed by high heat and pressure: **pinging**

At a hazmat incident a special technical group is typically added to the basic IMS system, under which 5 functions of the Incident Command System does it develop?

Operations

An incident in which you have to call in a Hazmat Team is response Level ___. **II / 2**

A pH of 2 is considered a_____. **Strong Acid**

A pH of 12 is considered a ____. **Strong Base**

The 3 common stressors on a container: **Thermal, Chemical, Mechanical**

The type of release that gives you no time to react: **Detonation**

The release that occurs within 1 second or less: **Violent Rupture**

The release that you would get from a damaged or broken relief valve. **Rapid Relief**

The time frame that encompasses days, weeks and months and allows moderate to high hazards: **Medium Term**

The only offensive tactical objective, to stop a leak, that the operations level is allowed: **Remote shut-off**

After Control Zones are established and public protection actions are initiated, the next activity that should be performed is: **Establish an Emergency Decon**

The type of radiation that can be blocked by the layer of dead skin and is harmful if it is inhaled, ingested, or injected is: **Alpha**

The most common Class 9 ORM is: **Consumer Commodities**

A material that will destroy living tissue and has a severe destructive effect on metals is a: **Corrosive, Class 8**

EPA registration # 123-45-6789; 45 represents _____.

The chemical

What is required on a pipeline? **Signal word, owner, product, 24hr emergency number**

How many controls zones are there as set by EPA? **3**

What are the public protective actions? **Evacuate, Shelter in place**

What type of foam should be used for materials such as alcohols and acetone? **Special purpose foam in polar solvent alcohol resistant concentrations**

_____ is the ability of some chemicals to pick up or capture another chemical. **Absorption**

_____is the ability of material to adhere to the outside of another. **Adsorption**

Anthrax and tularemia are _____. **BiologicalAgents**

Sarin and VX are _____. **Nerve Agents**

_____ occurs from direct contact with the material usually as a result of release or during the control phase. **Contamination**

_____ _____ is usually a result of coming contact with others, equipment, or incomplete decontamination.

Secondary Contamination

The weight of a solid or liquid compared to an equal volume of water. **Specific Gravity**

Weight of vapor compared to air. **Vapor Density**

The force exerted on the inside of a closed container. **Vapor Pressure**

A gas or liquid with a flashpoint below 141 degrees Fahrenheit. **Flammable**

A gas or liquid with a flashpoint 141 – 200 degrees Fahrenheit.

Combustible

Prior to anyone coming out of the Hot Zone; emergency decon can be set up in what level? **D**

What is the purpose of Emergency Decon? **To immediately reduce the threat to life through gross decontamination.**

UN identification numbers are required on vehicle containers containing at least ___ of hazardous materials.

A. 5,000 lbs (2 268 kg)
B. 6,250 lbs (2 834 kg)
C. 7,280 lbs (3 302 kg)
D. **8,820 lbs (4 000 kg)**

Which type of biological agent includes smallpox?

A. **Type A**
B. Type B
C. Type C
D. Type D

What tank car markings indicate the volume of the tank car tank?

A. Initials and number
B. **Capacity stencils**
C. Weight markings
D. Specification markings

Which dispersion pattern is *"a triangular-shaped pattern of a hazardous material with a point source at the breach and a wide base downrange"*?

A. Plume
B. **Cone**

C. Pool
D. Cloud

What type of foam creates a membrane rather than a film over the fuel?

A. Fluoroprotein foam
B. High-expansion foam
C. **Alcohol-resistant AFFF**
D. Film forming fluoroprotein foam

Which of the following are *"broad statements of what must be done to resolve the incident"*?

A. **Strategic goals**
B. Tactical objectives
C. Leak control goals
D. Recovery objectives

What term means to be mixed with water?

A. Aerated
B. Cooled
C. Separated
D. **Proportioned**

Which of the following is listed on a pesticide label?

A. **Routes of entry**
B. Recycling options for container
C. The UN/DOT hazard class and division
D. The words HARMFUL IF INHALED

Which foam method means to *"prevent the release of additional flammable vapors, access to oxygen in the atmosphere, and therefore reduce the possibility of ignition or reignition"*?

A. Cooling

B. Separating
C. **Suppressing**
D. Proportioning

Alcohol-resistant AFFF that is referred to as 3 by 6 concentrates is proportioned with:

A. **3 percent hydrocarbon fuels and 6 percent polar solvent fuels.**
B. 3 percent polar solvent fuels and 6 percent hydrocarbon fuels.
C. 3 percent polar solvent fuels, 3 percent hydrocarbon fuels, 3 percent other.
D. 6 percent hydrocarbon fuels and 6 percent polar solvent fuels.

What term is defined as: *"To change directly from a solid into a gas without going into a liquid state in between"*?

A. Miscibility
B. Metamorphose
C. Solubility
D. **Sublime**

What type of decontamination is performed on entry team personnel before technical decontamination?

A. Mass decontamination
B. **Gross decontamination**
C. Secondary decontamination
D. Technical decontamination

Which decontamination procedure means *"to quickly remove the worst surface contamination, usually by rinsing with water from handheld hoselines, emergency showers, or other water sources"*?

A. Buddy decontamination
B. **Gross decontamination**

C. Technical decontamination
D. Secondary decontamination

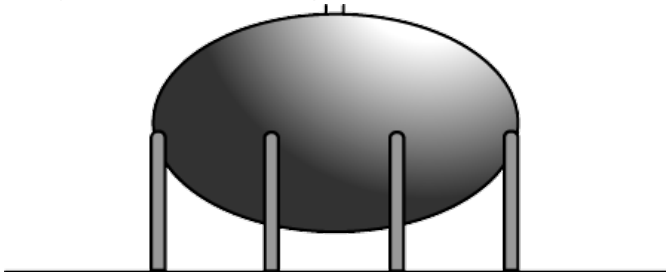
What is the top priority when collecting crime-scene evidence?

A. **Ensuring life safety**
B. Contacting law enforcement
C. Taking accurate notes and pictures
D. Minimizing disturbance to evidence

What is a liquid?

A. A substance that has no specific volume
B. A substance that independently has a specific shape and volume
C. **A fluid that has no independent shape but has a specific volume**
D. A fluid that has neither independent shape nor volume and tends to expand indefinitely

Which low-pressure storage tank is shown below?



A. Dome roof tank
B. **Spheroid tank**
C. Noded spheroid tank
D. Horizontal spheroid tank

Which hazard class does Soman (GD) fall under?

A. Class 2.2
B. Class 2.3
C. **Class 6.1**
D. Class 6.2

The most critical parameter when selecting the appropriate level of chemical protective equipment is: **Chemical Compatibility**

The best protective material against a specific chemical is one that has a low ____ rate and a long ____ time.

Permeation, Breakthrough

There is no assurance that once decontamination of CPC is complete that ____ has ceased. **Permeation**

The type of breathing system that cannot be utilized in an oxygen deficient atmosphere is an: **air-purification respirator**

What instrument can be used to determine the amount of product in a container: **Thermal Imaging Camera**

Which of the following is *not* an example of emergency radio traffic?

A. Distress messages
B. **Audible warning devices**
C. Urgent messages for additional resources
D. Urgent messages to relay detailed instructions

Which confinement tactic is *"a physical and/or chemical event occurring during contact between materials that have an attraction for each other"*?

A. **Absorption**
B. Adsorption
C. Blanketing/covering
D. Vapor suppression

What is the *"outer boundary of an incident that is controlled to prevent entrance by the public or unauthorized persons"*?

A. **Isolation perimeter**
B. Area of safe refuge
C. Decontamination zone
D. Triage/treatment area

What type of foam creates a membrane rather than a film over the fuel?

A. Fluoroprotein foam
B. High-expansion foam
C. **Alcohol-resistant AFFF**
D. Film forming fluoroprotein foam

Which of the following is *not* a symptom of hazardous materials exposure?

A. Loss of coordination
B. **Ringing sound in ears**
C. Blurred or double vision
D. Coughing or painful respiration

Which of the following temperature ranges are suitable for storage of foam concentrates?

A. 5º to 77º F (-15ºC to 25ºC)
B. 32º to 68º F (0º C to 20º C)
C. **35º to 120º F (2ºC to 49ºC)**
D. 50º to 160º F (10ºC to 71º C)

What do the first two numbers of an intermodal container size/type code indicate?

A. **Container length and height**
B. Container volume in gallons
C. UN/DOT identification number
D. UN/DOT hazard class/division

Which type of PPE provides the most limited protection against hazardous materials?

A. Vapor-protective clothing
B. Chemical-protective clothing
C. Liquid-splash protective clothing
D. **Structural fire-fighting protective clothing**

When inspecting an SCBA pressure indicator, be certain that the cylinder pressure gauge and remote gauge read within ____ percent of each other.

A. 5
B. **10**
C. 15
D. 20

Which type of PPE is neither corrosive-resistant nor vapor-tight?

A. Chemical-protective clothing
B. Liquid-splash protective clothing
C. High-temperature protective clothing
D. **Structural fire-fighting protective clothing**

What type of Thermal Protective Clothing is a *"one-piece coverall or individual pieces such as a jacket, hood, pants, or bib overalls"*?

A. **Proximity suit**
B. Fire-entry suit
C. Encapsulating suit
D. Nonencapsulating suit

Which of the following is *not* a required component of the Level B ensemble?

A. **Coveralls**
B. Hard hat
C. Inner chemical-resistant gloves
D. Two-way radio communications

When should used filters, cartridges, and canisters be replaced?

A. During daily inspections
B. During weekly inspections
C. During bi-yearly inspections
D. **During post-incident care**

Which of the following is a "chemical asphyxiant that interferes with oxygen utilization at the cellular level"?

A. Blister agent
B. **Blood agent**
C. Choking agent
D. Irritating agent

Phosgene and chlorine are examples of what?

A. Blood agents
B. Blister agents
C. Irritating agents
D. **Choking agents**

Which of the following is a primary responsibility of *only* an Awareness-Level first responder?

A. **Identifying the hazardous material(s) involved in an incident if possible**
B. Recognizing the presence or potential presence of a hazardous material
C. Recognizing container type and what type of material may be inside
D. Transmitting information to appropriate authority and calling for assistance

Which type of radiation can be stopped completely by a sheet of paper?

A. X-Rays
B. Neutrons
C. Gamma rays
D. **Alpha particles**

Improvised explosive devices are usually categorized by their:

A. size
B. shape
C. **container**
D. ingredients

As a rule, ____ the distance from a hazardous materials incident reduces the exposure by a factor of four.

A. halving
B. **doubling**
C. tripling
D. quadrupling

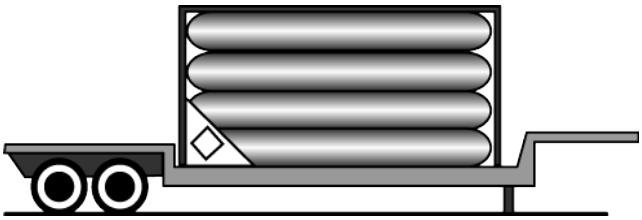
Which of the following is a characteristic of neutrons?

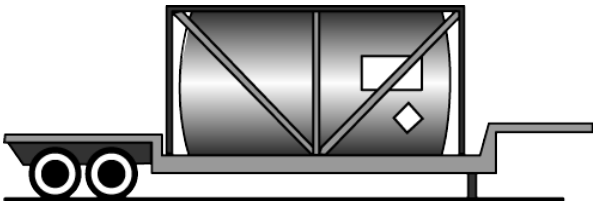
A. They are fast moving potentially or negatively charged electrons.
B. **They are most likely encountered in research laboratories.**
C. They are the single largest source of manmade radiation exposure.
D. They are high-energy protons that often accompany alpha or beta particle emissions.

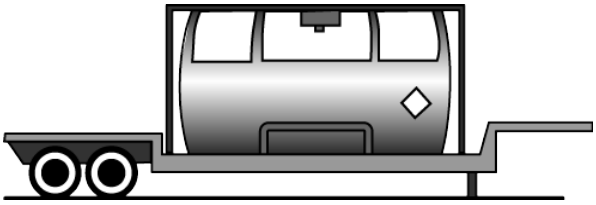
Which of the following is a characteristic of beta particles?

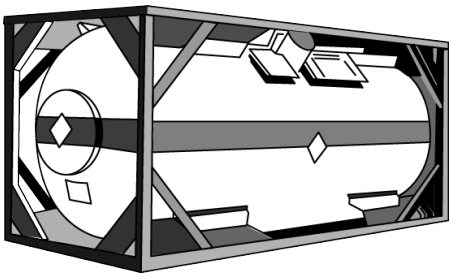
A. They are highly penetrating.
B. They are positively charged particles that rapidly lose energy in matter and do not penetrate very far.
C. They are usually completely absorbed by dead outer layer of human skin and so are not a hazard outside the body.
D. **They are fast moving positively or negatively charged particles.**

Which of the following is a cryogenic intermodal tank? **C**

A. 

B. 

C. 

D. 

On which containers/packages must UN identification numbers be displayed?

A. **Rail tank cars**
B. All nonbulk packages
C. Air freight transports
D. Fertilizer storage containers

Which level of haz mat incidents may pose a serious threat to life or property, but not often?

A. **Level I**
B. Level II
C. Level III
D. Level IV

Which level of haz mat incidents requires unified command?

A. Level I
B. **Level III**
C. Both Level I and II
D. Both Level III and IV

Which of the following is an element of the General Hazardous Materials Behavior Model?

A. **Release**
B. Puncture
C. Relief
D. Plume

Which of the following is *not* a material commonly used during chemical degradation?

A. **Baking powder**
B. Household bleach
C. Isopropyl alcohol
D. Liquid detergent

When are the effects of chemical attacks usually noticed?

A. **Within minutes or hours**
B. Within days or weeks
C. Within months or years
D. Within years or decades