

Model Hazardous Materials Emergency Response Procedures

Florida State Working Group HazMat Operations

Rev. August 26, 2019.

GAS CYLINDER AND CONTAINER EMERGENCIES

Title: Gas Cylinder and Container Emergencies

Purpose:

To establish procedures and provide guidance to the Hazardous Materials Response Team when they encounter gas cylinders and containers at a hazardous materials emergency incident.

Gas cylinders and containers can be divided into two (2) general types:

1. Compressed gas cylinders and containers.
2. Liquefied gases including cryogenics.

Compressed gas is any material that, when enclosed in a container, has an absolute pressure of more than 40 psi at 70 F, or an absolute pressure exceeding 104 psi at 130 F, or both. Compressed gases may be pressurized, liquefied or in a cryogenic state. High pressure gases are generally above 1000 psig.

Cryogenic gases are gases that have been compressed into liquid form with a boiling point of less than -150 F. Associated hazards include a tremendous liquid to gas ratio, extreme cold and other hazards associated with the particular gas such as flammability and being an oxidizer.

Policy:

This procedure will apply to all incidents where the Hazardous Materials Response Team responds and identifies what they believe is a gas cylinder or container.

Responsibility:

The Hazardous Materials Group Supervisor is responsible for making sure the Incident Commander (IC) is aware a gas cylinder or container is involved, and the Hazardous Materials Response Team shall follow these guidelines in assuring the safety of the Hazardous Materials Response Team members, operations personnel, and the general public.

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Procedures:

1. Identify Hot Zone if not already done and secure area (use U.S. DOT ERG or other source for determining evacuation distances).
2. Keep non-essential personnel away, this includes emergency response personnel.
3. Stay upwind and keep out of low-lying areas. Wind and temperature are critical factors in the behavior of gases.
4. Determine what the problem is:
 - a.) Fire
 - b.) Leak
 - c.) Container failure
 - d.) Uncontrolled reaction
 - e.) Unknown
5. Identify contents of container using (this can usually be done from a distance):
 - a.) Use D.O.T. labeling, Compressed Gas Association labels, lettering, etc.
 - b.) Color of cylinder (use caution as color coding is not standardized except for the medical gas industry standard.)
 - c.) Type of valve, relief devices or absence of, and connections.
 - d.) Shape, design, and size of cylinder/container.
 - e.) Markings on cylinder/container.
 - f.) Consult with on-site representatives.
6. Monitor and ventilate any confined areas prior to entering after ignition sources have been removed (use only natural ventilation, water fog, or explosive proof fans).
7. Consider multiple hazards of gas in addition to flammability.
8. Remember Personal Protective Equipment (PPE) will not protect you from high pressure gases that can tear the PPE apart and inject product into you. Use Positive pressure Self-Contained Breathing Apparatus (SCBA).
9. Never place hands or face over or near relief devices.
10. Air Purifying Respirators and other types of filter masks are not safe if the gas leak is uncontrolled.

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11. Besides being a gas emergency, these incidents are also chemical emergencies due to their unique properties (gases can be flammable, toxic and corrosive).
12. Cylinders that contain highly poisonous or highly toxic gases do not have relief valves.
13. Use of a pressure gauge will reveal how much gas is in a compressed gas cylinder (compare to rated pressure marked on cylinder/container).

Flammable Gas Spill or Leak

- Extinguish all sources of ignition in the area.
- Shut off gas supply remotely if possible.
- Use combustible gas detector to determine area of gas levels based on vapor density of gas (Remember flammable gas will extend outside the visible cloud if present).
- Close all valves on individual cylinders, get technical assistance/advice prior to closing any valves on systems (it could create a greater problem).
- Water fog can be used to disperse vapor clouds if compatible with product. Water miscible gases can be absorbed by fog streams (remembering run-off will be contaminated). Water fog also can be used to reduce pressure in cylinders by reducing temperature of container. Caution should be used in putting water on container/cylinder so as not to increase the size of the leak.
- Isolate cylinder/container from other cylinders/containers.
- Bond and ground all cylinders/containers prior to transferring product to prevent a buildup of static electrical discharge.
- Do not under any circumstances cut into an empty cylinder or container (residual vapors can be explosive).

Liquefied Gas Emergency

- Do not walk or step into pools of liquefied gas.
- Do not put water spray or fog on pool of liquefied gas (this can result in it freezing delaying evaporation or it can significantly increase the rate of vaporization).
- There is both gas and liquid in a cylinder.
- Due to the large expansion ratios, oxygen deficient environment can quickly develop (oxygen deficient atmosphere will affect combustible gas readings on monitors).
- In locating leaks, weighing of the cylinder can reveal the amount of product in the cylinder.

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- Liquefied gases evaporating can cause freeze injuries and failure of protective suits if they come into contact.
- When transferring product from a cylinder or container make sure equipment used is compatible with either liquid or gas product.
- A wet towel can be used to temporarily stop leaks.
- If leak cannot be stopped, try to turn the cylinder/container upside down to make it a gas leak instead of a liquid leak.

Cryogenic Liquid Emergency

- Extremely low temperatures are involved that can damage the structural integrity of many materials (tires exposed can fail, etc.).
- Cryogenic containers can also involve high vacuums.
- LOX (liquid oxygen) can upon contact cause petroleum-based products to ignite or become shock sensitive.
- Rapid expansion volumes can quickly make an area IDLH.
- Specialized PPE is required for safe handling of cryogenics.

Additional Requirements:

Gas leaks inside a structure/building are extremely hazardous and if flammable can create an explosive environment. Gas releases can also cause over pressurization of the structure resulting in structural failure (the windows may just be blown out). Generally, structures should not be entered until all ignition sources are eliminated and the building is ventilated.

Proper decontamination of personnel and equipment must be conducted after operating in a gas contaminated environment.