Title: Container Emergencies - Flaring of Liquefied Petroleum Gases (LPG)

Purpose

To establish procedures and provide guidance to the Hazardous Materials Response Team when they encounter a situation that would require the flaring of LPG at a hazardous materials emergency incident.

Flaring – Controlled burning of a high vapor pressure liquid or compressed gas in order to reduce or control the pressure and / or dispose of the product.

Policy

This procedure will apply to all incidents where the Hazardous Materials Response Team responds and determines that a flaring operation would be appropriate.

- Used to achieve three basic objectives:
    1. Reduce the pressure inside of a cargo tank.
    2. Dispose of vapors remaining inside of the tank after liquid has been transferred.
    3. Burn off liquid when other transfer methods are not possible.
- Flaring is an acceptable alternative when it is necessary to expedite recovery operations.
- Flaring is also an alternative as an interim step when other product transfer operations are not available or not possible due to accessibility.

Applicability

This policy shall be utilized to guide selection and use of the appropriate equipment in performing a flaring operation. The Hazardous Materials Group Supervisor is responsible for making sure the Incident Commander is aware of the hazards involved and the Hazardous Materials Response Team follow these guidelines in assuring the safety of the Hazardous Materials Response Team members, operations personnel, and the general public.

Procedure:

1. Identify Hot Zone if not already done and secure area.
    a) The Hot Zone will include the area of radiant heat exposure and not just the gas free atmosphere.
        i. All items and structures exposed to radiant heat must be protected with a hose stream and shielding as appropriate.

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   ii. Hose streams must be of sufficient size to adequately dissipate the radiant heat.
      - Caution - Large volumes of water can cause flooding and movement of containers.

b) Only personnel essential to the operation should be in Hot Zone.

2. Determine what the problem is:
   a) Fire
   b) Leak
   c) Container failure / damage
3. Verify contents of container using:
   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 tank.
   e) Information from responsible party.
4. Determine whether it is safe to conduct flaring operation.
   a) Proper equipment available to perform flaring.
   b) Adequate exposure protection available.
   c) Sufficient distances available.
   d) Consensus with product supplier to flare.
   e) Area free of combustible vapors.
   f) Damage assessment done of tank.
   g) Overhead power lines removed or de-energized.
   h) Position of tank does not prevent safe removal of product.
5. Specific site safety considerations which should be addressed during this phase of the incident include:
   a) Ensure that backup crew is available and in place to protect all personnel involved in the flaring operation.
   b) A minimum of two 1 ¾" hose-lines shall be deployed; one to protect firefighters and one for possible exposures.
   c) Make sure all personnel know the emergency evacuation signal and the escape path for personnel working in the Hot Zone.
   d) Continuously monitor the hazard area with flammable gas monitors.
   e) Maintain hazard control zones throughout the flaring operation and enforce personnel protective equipment requirements.
   f) Ensure all personnel remain alert throughout the operation. Frequent relief and rotation of personnel should be considered to prevent problem.
   g) Ensure the burner head is sufficiently above the ground to prevent ground fires and damage to supply hose. (Remember flaring of liquid product produces much greater radiant heat than gas.)

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Autorefrigeration – As propane vaporizes, the liquid portion in the tank cools. If the vapor rate is high enough the liquid will refrigerate to as low as -44° F (propane's boiling point), at this point vaporization will stop and it will appear the container is empty while super-cooled liquid remains in the container.

Minimum Equipment Required:

1. 300 feet of 1 inch flaring hose
2. Flaring tree stand with burner for both liquid and gas
3. Either a liquid valve or vapor valve to connect to tank and hose
4. Road flare on six foot or longer pole to light flaring tree burner.

Additional Requirements:

Reference Chart for flaring rates of 1 inch diameter hose.

FLARING RATES FOR 1-INCH DIAMETER HOSE
Flow Rates for 1-Inch Diameter Rubber Hose

Temperature Propane, F	Flow Rate, Gallons/Hour	Flow Rate, LB/Hour	Flow Rate, BTU/Hour	Time to Empty 30,000 Gallons of Propane, Hours
0	**169**	**710**	**15435277**	**177.5**
10	**215**	**903**	**19636595**	**139.5**