

Los Angeles City Fire Department

Training Bulletin #86

Date of Issue 1-94

STRUCTURAL FUMIGATIONS AND OTHER PESTICIDES

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1. INTRODUCTION

Tented structural fumigations have a widespread use in the City of Los Angeles. This information will provide a better understanding of the fumigants, and common pesticides that are used in and around structures for pest control. Safe and effective guidelines for handling incidents involving structures being fumigated will be discussed. There are approximately 4,500 fumigations per month in Los Angeles County. Additionally, there are 4,000 to 5,000 other commercial uses of pesticides daily.

An application of a pesticide is considered a fumigation only if the structure or cargo container being fumigated is tented and/or sealed. There are currently only two chemicals being used in Los Angeles for structural fumigations. They are Methyl Bromide and Sulfuryl Fluoride (trade name Vikane). Both of these chemicals use Chloropicrin as a warning agent. Additionally, there are chemicals using metal phosphides which are used to fumigate commodity containers transported by rail or ship. This Training Bulletin will primarily discuss pesticides used in fogging and spraying for pest control.

2. HISTORY

In the past, cyanide gas was used for fumigating structures. We are all aware of the extreme hazards of cyanide. For these reasons, cyanide was eventually replaced by Methyl Bromide and Chloropicrin. Methyl Bromide is very effective on termites, rats, and other pests. Recently, requirements placed on Methyl Bromide have become very strict. As a result, it now takes at least five days to complete a fumigation with this chemical. It appears that Methyl Bromide may very well be completely discontinued in the future because it is believed to have a negative impact on the ozone layer, as it is a halogenated agent.

Primarily because of the time frame involved when using Methyl Bromide, Vikane has taken its place as the chemical of choice by the fumigation industry. Approximately 95% of all structural fumigations are done with Vikane. Methyl Bromide is primarily used in vacant structures where the time frame is not a factor.

3. APPROPRIATE PROTECTIVE EQUIPMENT AND FUMIGANT PROPERTIES

Methyl Bromide, Vikane, and Chloropicrin are all heavier than air in a gaseous state. Whether a chemical is skin absorbent or not is the primary factor in determining the degree of protection required to safely enter a contaminated atmosphere. Our Department's policy is that structures undergoing fumigation should be thoroughly ventilated prior to entering. Additionally, full protective clothing and Self-Contained Breathing Apparatus (SCBA) during fumigation incidents are required. Fully encapsulating suits included in a full hazardous materials response would be required with an uncontrolled release or spill where the possibility of direct contact with these materials in their liquid or mist form exists.

4. CHEMICALS

A. Vikane

Vikane is a trade name for a fumigant composed of Sulfuryl Fluoride. It is manufactured for structural fumigations and can only be purchased for licensed commercial use. Vikane is a non-flammable, colorless, odorless, chemical with a boiling point of -67 degrees fahrenheit. It is stored and transported in pressure vessels in a liquid form. It is essentially non-irritating to the skin and not considered skin absorbent in the gaseous form. However, skin contact with liquid Vikane could cause frostbite due to its very low storage temperature.

The threshold limit value (TLV) (exposure of eight hours per day, five days per week) for Vikane is five parts per million (ppm). The short term exposure limit is 10 ppm for 15 minutes. The maximum amount of material used in structural fumigations is about 3,800 ppm. Vikane has a half life of 12 hours. During laboratory test, animals were exposed to 100 ppm, 35 hours a week for 6 months in a chronic exposure test and were found to have suffered no adverse effects. Vikane is two-thirds as toxic as Methyl Bromide in a single inhalation exposure.

B. Methyl Bromide

Methyl Bromide is used to control a wide variety of pests and rodents. About 95% of its use in the United States is for agricultural purposes. It is also used for fumigating commodities in everything from grain silos to warehouses of cheese. The majority of the food in our homes has, in one form or another, been treated with Methyl Bromide. Our primary concern in the City of Los Angeles is its use as a fumigant. This occurs primarily in structures; however, there is also extensive use on a daily basis on commodities in the harbor area.

Methyl Bromide is an organic chemical that is colorless, odorless, and has a boiling point of 38.5 degrees Fahrenheit. Its vapor density is 3.27, heavier than air. It is stored and transported in pressure vessels as a liquid. In a gaseous state it is not as easily absorbed through the skin as when in a liquid state. Methyl Bromide has a flammable range of 10% to 16% which gives it a classification of "1" on the NFPA 704 label in flammability. During fumigations, Methyl Bromide is used at a rate far less than the lower flammable limit.

The TLV is three ppm; however, most labels and written information still indicate five ppm. The maximum amount of chemical used in structural fumigations is 4,000 to 6,000 ppm. Methyl Bromide has a half life of 12 hours.

C. Chloropicrin

Chloropicrin (tear gas) is an irritant with a very strong odor. It is used in small concentrations as a warning agent in fumigation chemicals (Vikane and Methyl Bromide). It comes mixed with Methyl Bromide from the manufacturer. When used with Vikane, it is introduced into the structure prior to the Vikane.

Chloropicrin is non-flammable, has a boiling point of 234 degrees fahrenheit, and a vapor density of 5.7, heavier than air. It is not considered skin absorbent in the gaseous state. The percentage of material used in a structure is .025% or about 250 ppm. Even with its higher boiling point, it remains in a gaseous state at normal temperatures. The TLV is .1 ppm.

D. Aluminum Phosphides

Aluminum Phosphides are used in tablet form for fumigating commodities. They can legally be used to fumigate almost any bulk container that is not going to be transported on public highways, which means they could be used in the cargo holds of a ship, railroad cars; or containers stored in the harbor. With most commodities, the tablets are simply distributed in the commodity as it is being loaded. Containers being fumigated are required to be placarded.

Aluminum Phosphide Tablets are reactive with water and other liquids. The tablets are activated during fumigations by the moisture in the air. This reaction produces Hydrogen Phosphide Gas which is the actual pesticide chemical. The gas will normally dissipate to a safe level after three days.

Hydrogen Phosphide Gas is colorless with a garlic like odor. Its vapor density is 1.18, it has a flash point of 212 degrees fahrenheit and is not skin absorbent. The gas has a tendency to readily disperse which makes it an ideal gas to use in bulk materials. It also means it will dissipate rapidly in the atmosphere.

Incidents involving this material would most likely occur in the harbor area involving a ships hold or cargo containers on the dock.

During an incident involving spilled tablets, do not use water. Establish a safe perimeter, consider Hazardous Material Response, and let a licensed company handle the cleanup. The residual dust from completely spent tablets does not present a hazard.

A fire involving in a container being fumigated, may be extinguished with water, with consideration given to the increased gas release from the tablets. If the fire involved bulk quantities of tablets, the use of water could present a major - vapor cloud. There are no manufacturers or warehouses of tablets in the City of Los Angeles.

The most common trade names of Aluminum Phosphides are:

- Phostoxin
- Detia Tablets and Pellets
- Gas Ex-B

E. Other Pesticides

In addition to the above, there are a large number of pesticides used by pest control companies for fogging and spraying. Pesticides can be extremely dangerous to humans in high concentrations through inhalation without proper protection. Pesticides in a high concentration of liquid are skin absorbent. Concentrations of the primary chemicals are 1 to 5 percent, and all the active ingredients including the primary chemical are normally between 5 and 15 percent. Inert materials make up the balance of the pesticides.

Pesticides are less hazardous than fumigants. Breathing apparatus and adequate ventilation will provide adequate protection.

5. PRIVATE INDUSTRY REGULATIONS THAT IMPACT LAFD OPERATIONS

Vikane and Methyl Bromide

When tenting structures, large tarps are laid over them. Then, the seams are rolled together and secured with metal clips. After the structure is tented, Vikane or Methyl Bromide is introduced from a pressure vessel outside the structure in gas form through a hose. At least one electric fan is left operating during the entire fumigation process to keep the fumigant circulating so it does not settle to the low areas.

Multiple warning signs are then placed around the structure. These signs, by law, indicate the type of fumigant, when it was applied, the name of the fumigant company, and a 24-hour telephone number. The signs used are two-sided with Vikane on one side and Methyl Bromide on the other. The material being used is indicated by the exposed side. That side will have the most recent date of application. This information appears to be reliable most of the time. However, there have been fraudulent cases when a company has applied Methyl Bromide and labeled it Vikane. Methyl Bromide is less expensive and more effective.

Vikane fumigation tents are left in place 18 to 24 hours and then removed. The structures are then ventilated down to five ppm. After six hours the occupants may reoccupy the building.

Methyl Bromide tents are left in place 18 to 24 hours and then removed. They are ventilated down to three ppm. From that point, when fans are used for ventilating, there is a three day waiting period before the building can be occupied. The minimum time involved for a Methyl Bromide fumigation would be five days, with the use of fans for ventilation. The total time would be extended to eight days without the use of fans.

The current procedure (revised 1/92) for tent removal and ventilation by the contractor is:

1. Prior to removing the tent, a worker using a SCBA opens the tent, puts a fan and sock in place to draw the fumigant upwards and out of the space between the building and the tent. As a result, the tent collapses somewhat and the volumetric area between the building and the tent is decreased.
2. The tent is then removed by workers without the use of SCBA's.
3. A certified worker wearing a SCBA enters the structure and opens it up.
4. Fans are put in place to ventilate the structure.

6. PROCEDURES FOR PERFORMING RESCUES IN TENTED STRUCTURES UNDERGOING FUMIGATION

The primary characteristic impacting our ability to manage these incidents involving Methyl Bromide and Vikane is that they are both non-skin absorbent in the gaseous state and the required protection is through ventilation, self-contained breathing apparatus, and full protective clothing.

A Hazardous Materials Task Force response is not necessary on these incidents. However, do not confuse a tented fumigation with liquid leaking from a damaged cylinder. In those instances, a Hazardous Materials Task Force response is required for their testing equipment, possibly their cylinder patching capability and fully encapsulating protection.

Survival of a victim with an exposure to Vikane is dependant upon the concentration of the fumigant and the duration of the exposure. The time frame for exposure to high dosage (1,000 ppm or more) is considered critical when exposure is 30 to 60 minutes.

State certified pest control operators are knowledgeable and can be of assistance to us in handling fumigant incidents. They carry testing equipment for Vikane which we do not have. The fumigation company should be notified as soon as possible. Also, it is required that the County Department of Food and Agriculture be notified.

The following procedures are recommended for tent removal and ventilation:

1. The area outside of a tented structure is considered a safe area while the seams and sandbags are intact. To be on the safe side, wear SCBA and full protective clothing when working in or adjacent to the structure.
2. Evacuation of surrounding residences is not required of fumigant companies during ventilation. We may want to consider doing so on the down wind side of our ventilation, if another residence is within 20 feet. Our blowers will ventilate a structure faster and with more force than the private industry fans.

3. Members should go around the base of the structure removing the sandbags and seam clips.
4. Ladder the structure and proceed to the roof. From there, pull the tent up to the roof.
5. Open the building on two sides and put blowers in place. A team of rescuers (with a back-up team suited up) may enter the building at this time.

Decontamination of patients is not needed for exposure to Vikane or Methyl Bromide in the gaseous state. However, due to a lack of accurate information, hospitals may require removal of clothing and a wash down before they will accept a patient exposed to Methyl Bromide Gas.

NOTE: If it is reasonably suspected the rescue may involve a victim who has made an unauthorized entry into the structure and could present a threat to the safety of our members, a request should be made for a Police Department Unit trained in the use of SCBA prior to any rescue attempt by our Department.

7. FIRST AID FOR VICTIMS

A victim exposed to Vikane or Methyl Bromide may experience any of the following symptoms:

- Respiratory Irritation
 - Slow or garbled speech
- Abdominal Pain
 - Slow body movements
- Central Nervous System Depression
 - Numbness of extremities
- Nausea
 - Dulling of awareness

Anyone exposed that displays any of the above symptoms should:

- Immediately be taken to fresh air.
- Provide life support, if necessary.
- Keep the victim at rest.
- Maintain body temperature.
- Provide transport to a medical facility as soon as possible. Victims have been known to survive even after exposures that have brought on convulsions.

8. CONCLUSION

A spill involving a high concentration of a fumigant or pesticide (primarily in a liquid form) would necessitate implementing most of the Hazardous Materials Incident Command System. However, there is a major difference between the procedures necessary to handle a large liquid spill and a controlled release of a relatively low concentration of a fumigant.

The information outlined in this Training Bulletin should assist in the management of most incidents involving structures under fumigation and pesticides.