

STORED RAW AGRICULTURAL COMMODITIES (NOT PROCESSED FOOD) - HORSERADISH (ROOTS)

General Information

GENERAL INFORMATION AND INSTRUCTIONS

THIS FUMIGANT IS A HIGHLY HAZARDOUS MATERIAL AND SHOULD BE USED ONLY BY INDIVIDUALS TRAINED IN ITS PROPER USE. BEFORE USING, READ AND FOLLOW ALL LABEL PRECAUTIONS AND DIRECTIONS. ALL PERSONS WORKING WITH THIS FUMIGANT MUST BE KNOWLEDGEABLE ABOUT THE HAZARDS, AND TRAINED IN THE USE OF REQUIRED RESPIRATOR EQUIPMENT AND DETECTOR DEVICES, EMERGENCY PROCEDURES, AND PROPER USE OF THE FUMIGANT.

B. Vacuum Chamber Fumigation.

- All precautionary procedures as outlined immediately following COMMODITY, FOOD, AND FEED FUMIGATION directions must be followed.
- Place articles to be fumigated in the steel chamber and draw the vacuum (25-27 inches mercury). Release fumigant into the chamber (usually through an appropriate heating unit to insure complete non-destructive vaporization of methyl bromide). See appropriate table for rates of application and exposure times.
- At the end of the exposure time, release the vacuum and change the air in the chamber at least two times. A vacuum of 15 inches mercury should be drawn for this purpose. After purging chamber, check fumigant concentration with a detection device. See Aeration and Reentry Section.

C. Railroad Car, Truck, Van, Trailer or Air/Sea Container Fumigation.

- All precautionary procedures as outlined immediately following COMMODITY, FOOD, AND FEED FUMIGATION directions must be followed.
- Railroad car should be placed on seldom used trackage or siding so that it will not have to be moved while under fumigation.
- Park vehicle or container out of traffic area-if possible, on the lee side of a building

to protect from winds. Do not fumigate while strong winds are blowing.

- Seal the doors, ventilators and other openings. If vehicle or container can not be adequately sealed, cover with tarpaulin or plastic sheeting. See Tarpaulin Fumigation Section.
- The end(s) of the shooting line(s) should be anchored inside an evaporation pan unless a volatilizer is used to apply gaseous fumigant. Use a fan or blower to aid in even distribution of the fumigant. Always apply fumigant from outside the vehicle.
- Place warning signs on doors and as needed to be easily visible.
- Secure or lock vehicle or container to ensure it is not moved before aeration. **DO NOT FUMIGATE VEHICLES IN TRANSIT.** Do not move trucks, vans, or trailers on roadways during fumigation. They must be completely aerated before movement is allowed. After the appropriate exposure period, open the unit and aerate at least one hour. The vehicle must be aerated to 5 ppm or less before movement is allowed. The vehicle may then be resealed for shipment. Transfer of containerized commodities under fumigation onto and off of ships is permissible.
- Consult appropriate table for specific articles, rates of application and exposure times.
- See Aeration and Reentry Section.

COMMODITY, FOOD AND FEED FUMIGATION

The Following Precautionary Procedures Must Be Followed For All Uses: (1) When used for fumigation of enclosed spaces (e.g., warehouses; grain bins or elevators; vaults; chambers; trucks, vans, railroad cars, ships and other transport vehicles; and tarpaulin-covered commodities), two persons trained in the use of this product must be present during introduction of the fumigant, initiation of aeration, and after aeration when testing for reentry. Two persons do not need to be present if application, aeration, monitoring and/or testing is conducted remotely (outside the area being fumigated). (2) Do not fumigate with this product when the space, commodity, or structure (excluding dwellings) to be fumigated is below 40°F for control of insects or below 20°F for control of rodents and other warm-blooded pests. Fumigation at different temperatures may be allowed or required under APHIS or other governmental quarantine treatment schedules. (3) If monitoring

indicates concentration of fumigant is insufficient to be effective for the target pest, additional fumigant may be added as required, but concentration is not to exceed prescribed rates of application. (4) When fumigating tanks, silos, etc., of stored bulk flour, empty or draw down flour to less than one meter deep. Do not introduce liquid methyl bromide into flour storages. Set up fans or air circulation to avoid localized high concentrations of methyl bromide when shooting gaseous methyl bromide into the storage. Do not overdose flour storages. It is recommended that the fumigant be applied outside flour storages that are inside buildings and allowed to drift in through open hatches.

A. Chamber and Vault Fumigation.

- All precautionary procedures as outlined immediately following COMMODITY, FOOD, AND FEED FUMIGATION directions must be followed.

- Load the chamber with the material to be fumigated, close exhaust ports, turn on circulating fan and close chamber door. Determine the proper rate of application and exposure time from appropriate table. Introduce the fumigant into the chamber by releasing it into the air stream in front of a blower or fan, passing it through a vaporizer, or allowing it to evaporate from a shallow pan. All controls should be outside the chamber.

- At the end of the exposure period, aerate by opening the exhaust port, turning on the exhaust fan and opening the chamber door slightly or an inlet port to permit fresh air to enter. At the end of the aeration period, check fumigant concentration with a detection device. See Aeration and Reentry Section.

D. Tarpaulin Fumigation.

- All precautionary procedures as outlined immediately following COMMODITY, FOOD, AND FEED FUMIGATION directions must be followed.

- The article or stacked articles should be placed on a concrete floor or other air-tight surface. If the floor or surface is not air-tight, it may be made so by sealing or covering it with additional tarpaulin or polyethylene sheeting. Provide a space on top of the stack for a gas expansion dome to facilitate distribution.

- Evaporating pans are essential for the volatilization and uniform dispersion of fumigant except where a vaporizer is used. Shallow pans or basins made of plastic

or metal (except aluminum) are satisfactory for this purpose. Use one evaporator pan for each 1000 cubic feet contained under the tarp.

- For delivery from outside the tarpaulin, do not use polyvinyl tubing; polyethylene tubing is recommended. Anchor one end of each tube into an evaporating pan with tape or a suitable weight. This ensures that the liquid will be directed into the evaporating pan. Place evaporating pan(s) with anchored applicator tubing in the center of the expansion dome. Extend the free ends of the polyethylene tubes outside the area to be covered.

- Cover and seal the stack with a gas tight tarpaulin or polyethylene sheeting of 4 mil or greater thickness. Allow a margin of at least two feet at the base of the stack for sealing. Sweep around the stack to provide a clean surface for sealing the tarpaulin. Seal tarpaulin to floor by sand and/or water snakes, by taping or by means of moist soil or sand.

- Attach each polyethylene tube to a can applicator or cylinder valve outlet and release fumigant. Use a cylinder dispenser or scale to meter small amounts from cylinders. Special units are available for use of 1 and 1.5 pound cans that combine opener and evaporating pan functions, and are designed to be used with all parts under the tarpaulin.

- Fans normally should be used in tarp fumigations to aid in the even distribution of fumigant. A vaporizer or heat exchanger may be required and is also useful to aid in application and distribution of the fumigant. Dosage rates and exposure times are shown in Table I through IV. At the end of the exposure period, unseal opposite ends of the tarpaulin and allow to aerate for at least one hour before completely removing the tarp. Check fumigant concentration with a detection device before allowing unprotected persons to enter the area. See Aeration and Reentry Section.

E. Warehouse, Grain Elevator, Food Processing Plant, and Other Structures Containing Commodities.

- All precautionary procedures outlined immediately following COMMODITY, FOOD, AND FEED FUMIGATION directions must be followed.

- Check with appropriate municipal and county authorities before fumigating to be completely familiar with local regulations. Ordinances may require watchmen or locks, during fumigation and/or notification of the nearest fire station.

1. Preparation for Fumigation.

- Remove or protect the following items from the structure to be fumigated: 1) all food and feed commodities not included in Tables I or II, 2) medicinals not sealed in metal or glass; 3) pets (including fish and birds); 4) furs, horsehair articles, and leather goods sensitive to methyl bromide; 5) rubber goods (natural latex); 6) carbonless carbon forms and blueprints; 7)

cinder blocks; 8) articles containing sulfur, 9) live cultures.

- Prior to fumigation, extinguish all open flames and turn off all high temperature electrical equipment, including laboratory ovens, pilot lights, gas refrigerators, oil burners, etc. This product in the presence of intense heat from such sources may generate some hydrobromic acid which may be injurious to commodities and equipment.

2. Sealing the Building.

- The most important part of the fumigation is the preparation and sealing of the structure. A thorough sealing job is necessary. Avoid fumigating under windy conditions. Sealing of the building begins with the closing of all external openings to the building. Wrap roof ventilators, chimneys and other large openings with a tarpaulin or plastic sheet and seal with duct or other appropriate tape. Screened and small openings may also be sealed with a wide, commercial duct or masking tape. Cleaning of the surfaces to be taped and the use of commercial spray-on adhesives will improve sealing.

- For masonry or metal structures, seal all cracks and other air leaks with caulking material or tape, and seal cracks around doors, windows, vents and other openings. Wooden structures and others that can not be readily sealed may be completely enveloped with an impervious tarpaulin. Seal securely all seams between tarps and seal the lower edges of the tarp to the ground with moist soil or with sand or water snakes. To prevent escape of gas through the ground and avoid injury to nearby plants, wet the soil to a depth of six inches for a distance of one foot outward from

the edge of the tarp.

- Exterior doors and windows should be tightly sealed and locked. Large exterior doors may require additional efforts to seal properly. Check for cracks around the eaves, in the floor and roof, and seal them.

- Special care should be taken to seal off adjacent storage or work areas of treatment sites that are not to be fumigated. Adjoining structures sharing a common wall should be cleared of occupants before fumigation. If this is not feasible, spread a glossy-type building paper along the adjoining wall to prevent spread of the fumigant into undesired areas. Sisal Kraft paper, asphalt-laminated paper, heavily oiled Kraft or wrapping paper and plastic film are appropriate. In all such cases where the adjoining structure is occupied, it should be checked frequently with a suitable gas detector during fumigation to ensure the safety of the occupants. Check local regulations for specific requirements.

- Doors or hatches on milling machinery should be opened prior to fumigation. These include elevator boots, conveyor lids, settling chamber doors, dust trunks, and any other openings that will allow fumigant into the equipment. Inside doors, openings to attics and crawlspaces, cabinets, lockers, and drawers should also be opened to facilitate treatment and aeration. "Dead" spouts are particularly difficult to penetrate and should be opened before the fumigation.

- Set up fumigant application equipment and fans as necessary to achieve uniform fumigant concentrations and to facilitate thorough aeration after the exposure period. The choice of a fan or fans depends upon fan capability to perform the desired function without jeopardizing the success of the fumigation. Small battery operated fans may be suitable in very small situations. A fan with tubing attached may be useful for internal recirculation of the fumigant within a building or space to aid in reaching and maintaining equalized concentrations. Adequate fans should also be available to effectively aerate difficult to ventilate situations because of construction of unexpected wind direction or calm. It may be possible to use heating system fans or other installations already in a building for improved circulation or distribution of product, as well as aid in ventilation after the exposure period. All fans used for the fumigation should be running when fumigant is being introduced and left running until uniform distribution has been accomplished. Fumigators should not enter a space or building under fumigation to turn fans off or on. See appropriate table for rate of application and exposure times.

3. Fumigating the Commodity—Inside Release.

- Cylinders should be placed by a team of two people, and the location of each cylinder in the building should be mapped. The cylinders should be arranged so that the fumigators can walk away from the released gas as they open each subsequent cylinder. It is recommended that polyethylene sheeting or something functionally similar be used underneath cylinders and at the point of release to prevent staining or damage to floor surfaces. Narrow cylinders should be secured to prevent tipping.

- Cylinders should be placed within a room for best distribution into all areas. Cylinders should be placed in a normal upright position and the shipping caps removed. Standpipes or curved pipes directed up and away from the cylinder can be attached. Polyethylene, nylon or similar tubing, possibly divided with toes or crosses, or other equipment can also be attached to facilitate distribution of the gas within the room or space to be fumigated.

- Place warning signs or placards on all entrances to the building. Signs and placards should conform to all local, state, and federal regulations. It is best to inform police, fire and health officials that a fumigation process is about to begin. Observe the location of the nearest outside telephone for use in case of an emergency.
- Practice or review the shooting procedure so that the operation will be done efficiently and safely. Respiratory protection equipment should be checked for leaks and other problems before the “practice session”. While wearing respiratory protection, quickly open and close the cylinder valves to make certain they are in working order and thus avoid delay during the actual release.
- Applicators should not be in the building longer than 30 minutes while releasing the gas. If it is impossible for one team to do it within this time period, additional experienced teams should be used. Two people should work together while the gas is being released and when entering the structure during aerating and testing.
- Fumigators should always remain in sight of each other from the time they open the first cylinder until the time they leave the building together. While the fumigant is being released, it is advisable to have additional people, with respiratory protection equipment ready, waiting outside to assist if necessary. One member of the team should record the release of the fumigant from each cylinder so that none are missed. After making sure fumigation area is vacated, immediately lock and seal the last exit.
- If guards are used, they should remain on duty during release, exposure, and aeration periods to prevent unauthorized entry.

4. Fumigating the Commodity—Outside Release.

- Releasing the fumigant from outside the space to be fumigated is possible in some situations and can minimize applicator exposure to the fumigant. Prepare the building as outlined previously.

- Secure the ends of each “shooting” line or hose to each point where the fumigant is to be released, using evaporating pans or plastic sheeting to prevent possible damage to some surfaces. Run each line to the cylinder(s) or manifold located outside the area to be treated. Connect each line to the cylinder(s) or manifold.
- When fumigating storages of bulk grain or other bulk commodities, such as silos, grain bins, tanks, etc., the fumigator should plan sealing and fumigant distribution to effectively fumigate all the target pests contained in the sealed space. The fumigant can be applied in several locations such as the top and bottom of the storage. For bulk commodities more than 20 feet deep, a permanent or temporary fumigant recirculation system should be considered. When recirculating fumigant through a closed loop system, plan to run fans long enough to achieve at least three complete cycles.
- After making sure fumigation area is vacated, immediately lock and seal the last exit. If guards are used, they should remain on duty during release, exposure, and aeration periods to prevent unauthorized entry.
- Open the valves to release the fumigant. Respiratory equipment must be available in the event of a major leak or equipment failure.

5. Aerating the Building.

- When the exposure period is complete, aeration generally should be started by opening previously sealed doors and windows on the ground floor. Ventilators accessible from the outside should be opened at this time. Fans should be on to assist aeration. Aeration is usually complete in four hours depending upon weather conditions and cross ventilation. No one should be allowed inside the building without respiratory protection until the methyl bromide concentration is 5 ppm or less in the worker areas.
- Contact the police, fire and health officials previously notified of the fumigation and inform them that it has been completed.

F. Shipboard, In Transit Ship or Shiphold Fumigation.

- IMPORTANT. Shipboard, in transit ship or shiphold fumigation is also governed by the U.S. Coast Guard Regulations. Refer to and comply with those regulations prior to fumigation.
- Prior to fumigating a vessel for in transit cargo fumigation, the master of the vessel or his representative and the fumigator must determine whether the vessel is suitably designed and configured so as to allow for safe occupancy by the ship's crew throughout the duration of the fumigation. If it is determined that the design and configuration of the vessel does not allow for safe occupancy by the ship's crew throughout the duration of the fumigation, then the vessel must not be fumigated unless all crew members are removed from the vessel. The crew members must not be allowed to reoccupy the vessel until the vessel has been properly aerated and a determination has been made by the master of the vessel and the fumigator that the vessel is safe for occupancy (5 ppm or below).
- The person responsible for the fumigation must notify the master of the vessel or his representative of the requirements: 1) relating to the use of respiratory protection equipment; 2) relating to the use of detection equipment; and 3) that a person qualified in the use of this equipment must accompany the vessel with cargo under fumigation. Emergency procedures, cargo ventilation, periodic monitoring and inspections, and first aid measures must be discussed with and understood by the master of the vessel or his representative.
- During fumigation, or until a manned vessel leaves port or the cargo is aerated, the person in charge of the fumigation shall ensure that a qualified person using gas detection equipment tests spaces for fumigant leakage. If leakage of the fumigant is detected, the person in charge of the fumigation shall take action to correct the leakage, or inform the master of the vessel, or his representative, of the leakage so that corrective action can be taken.
- Using appropriate gas detection equipment, monitor spaces adjacent to areas containing fumigated cargo and all regularly occupied areas for fumigant leakage. If leakage above 5 ppm is detected, the area should be evacuated of all personnel, ventilated, and action taken to correct the leakage, before allowing the area to be reoccupied. Do not enter fumigated areas except under emergency conditions. If necessary to enter a fumigated area, wear a NIOSH/MSHA approved self-contained breathing apparatus (SCBA) or combination air-supplied/SCBA respirator (personal

protection equipment). Never enter fumigated area alone. At least one other person, wearing personal protection equipment, should be available to assist in case of an emergency.

- If necessary to enter holds prior to discharge, test spaces directly above cargo surface for fumigant concentration, using an appropriate gas detector and while wearing personal protection equipment. Do not enter without respiratory protection, unless fumigation concentrations are at or below 5 ppm, as indicated by a suitable detector.

- If the fumigation is not completed and the vessel aerated before the manned vessel leaves port, the person in charge of the vessel shall ensure that there be on board the vessel during the voyage: 1) at least two NIOSH/MSHA approved self-contained breathing apparatus (SCBA) or combination air-supplied/SCBA respirators; 2) one gas detection device; and 3) a person qualified in their operation.

- Fumigation of any ship, shiphold, or a portion of the vessel (e.g., galley) requires careful planning. All precautionary procedures as outlined previously must be followed. Aeration should be planned so that it can be safely and effectively conducted. Adequate supplemental fans to ventilate quarters, decks, bottom of shipholds, etc., should be available for use. Tubing attached to fans or used as a temporary exhaust stack for aeration should also be prepared in advance. Recirculation system for fumigation of grain and other commodities in shipholds must be installed before loading.

- The master of the vessel or his representative and the fumigator should discuss security of an unoccupied vessel under fumigation and make arrangements to prevent unauthorized boarding. If a crew member will need to board such a vessel for a necessary ship function (e.g., boiler check) the crew member must be trained in the proper use of respiratory protection equipment. The fumigator should test all passageways and areas where the crew member will be entering to determine if fumigant concentrations exceed 5 ppm in the air. If concentrations exceed 5 ppm, then required respiratory equipment must be worn. See appropriate table for rates of application and exposure times.

Limitations, Restrictions, and Exceptions

Consult APHIS Treatment Manual for additional treatment conditions and

commodities.

EXPOSURE TIME (hrs): 1.5 - 4

Partial vacuum (15 inches mercury).

Method

[Fumigant](#)

Rates

[field_rates 0](#)

[field_rates 1](#)

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Timings

[N.A.](#)