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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

OFFICE OF  
PREVENTION, PESTICIDES  
AND TOXIC SUBSTANCES

SEP 23 2003

Ms. Betty Lilyquist  
D & D Holdings, Inc.  
PO Box 116  
Weyers Cave, VA 24486

Subject: Revised Labeling to Require a FMP and Other MOA Revisions  
Phostoxin® Tablets  
EPA Reg. No. 72959-4  
Phostoxin® Pellets  
EPA Reg. No. 72959-5 ✓  
Your Application Dated May 21, 2003

Dear Ms. Lilyquist:

The labeling referred to above, submitted in connection with registration under the Federal Insecticide, Fungicide, and Rodenticide Act, as amended, is acceptable subject to the comments listed below.

- The center panel of the container labeling must include the Skull and Crossbones Symbol. Draft labeling submitted to, and accepted by, the Agency should indicate that this symbol will be included since accepted labeling is stamped and placed on the Agency's website.
- On the front panel of the Applicator's Manual, replace the word "there" with "their" in the Restricted Use Statement, ie. "For retail sale to Dealers..." Please make this same correction on page 6 of the Manual under the Physical and Chemical Hazards section, in the sentence beginning "Aluminum phosphide tablets and pellets, outside their containers...."
- On page 6 of the Manual, in the third paragraph of the Physical and Chemical Hazards section, and in the fifth sentence, replace "Hydrogen Phosphide" with "Phosphine Gas".
- On page 7 of the Manual, please add the "Directions for Use" heading, followed by the misuse statement, ie.: "It is a violation of Federal Law..."
- On page 12 of the Manual, in section 10.1, please define "STELs". It is spelled out on


page 14, in section 15.1, however, it should be defined where the acronym first appears.

- In section 10.3 on page 12 of the Manual, delete the instruction appearing in parentheses regarding availability of SCBA, “(for example, at a fire station or rescue squad)”. As Dr. Oonnithan indicated in an earlier review of this text, a rescue squad would not be apt to lend its equipment. Therefore, SCBA must be present at the site as part of the mandatory equipment for use of PH3.
- In section 8.2 on page 11 of the Manual, “Recommended Fumitoxin Dosages”, we believe that the correct dosage range for item 1, Vertical Storages, should be 200-900 pellets/1000 bu. This is based on the range of 40-180 tablets/1000 bu., with 1 tablet approximately equivalent to 5 pellets. Please make the appropriate corrections to the recommended dosages for these sites.
- On page 11 of the Manual, the recommended dosage range for fumigation of barges using tablets should be 60-180/1000 bu.
- In section 18.3 on page 17 of the Manual, “Aeration of Fumigated Commodities, Tobacco”, add the phrase “...or until concentration is below 0.3 ppm” to the end of the first sentence. Delete the last sentence (“If residues are less than tolerance levels...”) since reference to tolerances is not appropriate for tobacco.
- As you discussed with Meredith Laws on August 11, 2003, please insert the words “and follow” in the first sentence of section 21, “Fumigation Management Plan” on page 18. The sentence should read:
 

“The certified applicator is responsible for working with the owners and/or responsible employees of the structure and/or area to be fumigated to develop and follow a Fumigation Management Plan (FMP).”
- In the “Guide for Preparation of a Fumigation Management Plan” on page 19, make the following corrections to the last sentence in the second paragraph: “By following a step-by-step procedure, which allows for flexibility, a safe and effective fumigation can be performed.”
- On page 21, in section B-6, change the word “and” to “an” (...an emergency).
- Under section 22.4 on page 25, we believe that item no. 8 should say “Spread Phostoxin on the sheets at a density no greater than 30 tablets per sq. ft. or 150 pellets per sq. ft.” rather than “...75 pellets per sq. ft.” This is based on your information that one tablet is about equivalent to 5 pellets.
- On page 26, item no.10 under section 22.4, please spell out “PPE”, ie. Personal Protective Equipment. We could not find anywhere that this acronym appears earlier in the label.

- In section 22.5 on page 26, reference is made to section 15 for recommendations on placarding. This reference should be section 16.
- In section 29.2 on page 35 of the Manual, replace "10 gallons" with 15 gallons" in the instructions for deactivation.
- On page 36, delete the final sentence: "The EPA has determined that proper disposal of aluminum phosphide will cause no unreasonable adverse effects to the environment."

The Memorandum of Agreement between the Agency and the Registrants of phosphine based fumigants requires that within six (6) months of receiving stamped and approved labels from the Agency, all phosphine products released for shipment shall bear the amended and approved labels and be accompanied by the Applicator's Manuals. Additionally, please submit two (2) copies of the finished, corrected labeling to the Insecticide-Rodenticide Branch of the Registration Division prior to releasing the product for shipment. A stamped copy of the label is enclosed for your records. If you have any questions regarding this action, please contact me at (703) 305-7546.

Sincerely,  
  
Dan Kenny  
Product Manager 1  
Insecticide-Rodenticide Branch  
Registration Division (7505C)

Enclosure

## 2. NOTE TO PHYSICIAN

~~Phosphine~~ aluminum phosphide fumigants react with moisture from the air, water, acids and many other liquids to release phosphine gas. Mild inhalation exposure causes malaise (indefinite feeling of sickness), ringing of ears, fatigue, nausea, and pressure in the chest, which is relieved by removal to fresh air. Moderate poisoning cause's weakness, vomiting, pain just above the stomach, chest pain, diarrhea and dyspnea (difficulty in breathing). Symptoms of severe poisoning may occur within a few hours to several days, resulting in pulmonary edma (fluid in lungs) and may lead to dizziness, cyanosis (blue or purple skin color), unconsciousness, and death.

In sufficient quantity, phosphine affects the liver, kidneys, lungs, nervous system and circulatory system. Inhalation can cause lung edema (fluid in lungs) and hyperemia (excess of blood in a body part), small perivascular brain hemorrhages and brain edema (fluid in brain). Ingestion can cause lung and brain symptoms but damage to the viscera (body cavity organs) is more common. Phosphine poisoning may result in (1) pulmonary edema, (2) liver elevated serum GOT, LDH and alkaline phosphatase, reduced prothrombin, hemorrhage and jaundice (yellow skin color) and (3) kidney hematuria (blood in urine) and anuria (abnormal or lack of urination). Pathology is characteristic of hypoxia (oxygen deficiency in body tissue). Frequent exposure to concentrations above permissible levels over a period of days or weeks may cause poisoning. Treatment is symptomatic.

The following measures are suggested for use by the physician in accordance with his own judgment:

In its milder forms, symptoms of poisoning may take some time (up to 24 hours) to make their appearance, and the following is suggested:

1. Give complete rest for 1-2 days, during which the patient must be kept quiet and warm.
2. Should patient suffer from vomiting or increased blood sugar, appropriate solutions should be administered. Treatment with oxygen breathing equipment is recommended as is the administration of cardiac and circulatory stimulants.

In cases of severe poisoning (Intensive Care Unit recommended):

1. Where pulmonary edema is observed, steroid therapy should be considered and close medical supervision is recommended. Blood transfusions may be necessary.
2. In case of manifest pulmonary edema, venesection should be performed under vein pressure control. Heart glycosides (I.V.) (in case of hemoconcentration, venesection may result in shock). Upon progressive edema of the lungs: immediate intubations with a constant removal of edema fluid and oxygen over-pressure respiration, as well as measures required for shock treatment are recommended. In case of kidney failure, extracorporeal hemodialysis is necessary. There is no specific antidote known for this poisoning.
3. Mention should be made here of suicidal attempts by taking solid phosphide by mouth. After swallowing: emptying of the stomach by vomiting, flushing of the stomach with diluted potassium permanganate solution or a solution of magnesium peroxide until flushing liquid ceases to smell of carbide, is recommended. Thereafter, apply medicinal charcoal.

ACCEPTED  
with COMMENTS  
In EPA Letter Dated  
Sept. 23, 2003  
Under the Federal Insecticide,  
Fungicide, and Rodenticide Act,  
as amended, for the pesticide  
registered under EPA Reg. No.  
72959-4, -5

**APPLICATOR'S MANUAL  
FOR  
PHOSTOXIN® Tablets and Pellets**

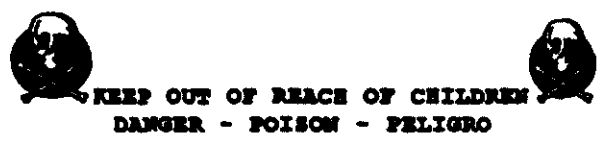
**THIS PRODUCT MUST BE ACCOMPANIED BY AN APPROVED LABEL AND APPLICATOR'S MANUAL. READ AND UNDERSTAND THE ENTIRE LABELING AND APPLICATOR'S MANUAL. ALL PARTS OF THE LABELING AND APPLICATOR'S MANUAL ARE EQUALLY IMPORTANT FOR SAFE AND EFFECTIVE USE OF THESE PRODUCTS. CONSULT WITH YOUR STATE LEAD PESTICIDE REGULATORY AGENCY TO DETERMINE REGULATORY STATUS, REQUIREMENTS, AND RESTRICTIONS FOR FUMIGATION USE IN THAT STATE. CALL (540) 234-9281 or 1-800-330-2525 IF YOU HAVE ANY QUESTIONS OR DO NOT UNDERSTAND ANY PART OF THIS LABELING**

**RESTRICTED USE PESTICIDE  
DUE TO HIGH ACUTE INHALATION TOXICITY OF PHOSPHINE GAS**

For retail sale to Dealers and Certified Applicators only.  
For use by Certified Applicators or persons under their direct supervision, and only for those uses covered by the Certified Applicator's certification. Refer to the directions in this applicator manual for requirements of the physical presence of a Certified Applicator.

**FOR USE AGAINST INSECTS WHICH INFEST STORED  
COMMODITIES AND CONTROL OF BURROWING PESTS**

Active Ingredient: Aluminum Phosphide . . . . .	55.0%
Inert Ingredients: . . . . .	45.0%
<b>Total</b>	<b>100.0%</b>



**PRECAUCION AL USUARIO:** Si usted no lee ingles, no use este productor hasta que la etiqueta se le haya sido explicado ampliamente.  
(TO THE USER: If you cannot read English, do not use this product until the label has been fully explained to you.)

**D & D HOLDINGS INC.  
P.O. BOX 116  
153 Triangle Drive  
Weyers Cave, VA 24486 USA  
Telephone: (540) 234-9281 / 1-800-330-2525  
Fax: (540) 234-8225  
Internet: [www.degeschamerica.com](http://www.degeschamerica.com)  
Email: [degesch@degeschamerica.com](mailto:degesch@degeschamerica.com)  
EPA Establishment Number: 40285-VA-01**

**EPA Reg. No.: 72959-4 PHOSTOXIN Tablets  
72959-5 PHOSTOXIN Pellets**





## 2. NOTE TO PHYSICIAN

~~RESTORATION~~ Aluminum phosphide fumigants react with moisture from the air, water, acids and many other liquids to release phosphine gas. Mild inhalation exposure causes malaise (indefinite feeling of sickness), ringing of ears, fatigue, nausea, and pressure in the chest, which is relieved by removal to fresh air. Moderate poisoning cause's weakness, vomiting, pain just above the stomach, chest pain, diarrhea and dyspnea (difficulty in breathing). Symptoms of severe poisoning may occur within a few hours to several days, resulting in pulmonary edma (fluid in lungs) and may lead to dizziness, cyanosis (blue or purple skin color), unconsciousness, and death.

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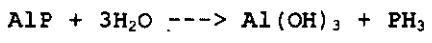


**3. INTRODUCTION**

**PHOSTOXIN® tablets and pellets** are used to protect stored commodities from damage by insects and other vertebrate pests. Fumigation of stored products with **PHOSTOXIN** in the manner prescribed in the labeling does not contaminate the marketed commodity.

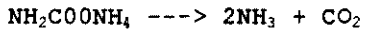
**PHOSTOXIN** metal phosphide fumigants are acted upon by atmospheric moisture to produce phosphine gas.

**PHOSTOXIN** tablets and pellets contain aluminum phosphide (AlP) as their active ingredient and will liberate phosphine via the following chemical reaction:



Phosphine gas is highly toxic to insects, burrowing pests, humans, and other forms of animal life. In addition to its toxic properties, the gas will corrode certain metals and may ignite spontaneously in air at concentrations above its lower flammable limit of 1.8% (v/v). These hazards will be described in greater detail later on in this Applicator's Manual.

**PHOSTOXIN** also contains ammonium carbamate, which liberates ammonia and carbon dioxide as follows:



These gases are essentially nonflammable and act as inerting agents to reduce fire hazards.

**PHOSTOXIN** is prepared in two spherical shapes. The rounded tablets weigh approximately 3 grams and will release 1 gram of phosphine gas. They are about 16mm in diameter. The pellets are about 10mm in diameter, weigh approximately 0.6 gram and release 0.2 gram of phosphine gas.

**DEGESCH PHOSTOXIN** Tablets are provided in 21kg cases, contain 14 resealable, gas-tight flasks of 500 tablets each or, 70 flasks of 100 tablets each.

**DEGESCH PHOSTOXIN** Pellets are provided in 21kg cases containing 21 resealable, gas-tight flasks of 1660 pellets each or, 14 flasks of 2490 pellets each.

Upon exposure to air, **PHOSTOXIN** tablets and pellets begin to react with atmospheric moisture to produce small quantities of phosphine gas. This reaction starts slowly, gradually accelerates and then tapers off again as the aluminum phosphide is spent. **PHOSTOXIN** pellets react somewhat faster than do the tablets. The rates of decomposition of the tablets and pellets will vary depending upon moisture and temperature conditions. For example, when moisture and temperature of the fumigated commodity are high, decomposition of **PHOSTOXIN** may be complete in less than 3 days. However, at lower ambient temperatures and humidity levels, decomposition of **PHOSTOXIN** may require 5 days or more. After decomposition, **PHOSTOXIN** leaves a gray-white powder composed almost entirely of aluminum hydroxide and other approved inert ingredients. This will cause no problems if the fumigant has been added directly to a commodity such as grain. However, the spent powder must usually be retrieved for disposal after space fumigations. If properly exposed, the spent **PHOSTOXIN** will normally contain only a small amount of unreacted aluminum phosphide and may be disposed of without hazard. While spent **PHOSTOXIN** is not considered a hazardous waste, partially spent residual dusts from incompletely exposed **PHOSTOXIN** will require special care. Precautions and instructions for further deactivation and disposal will be given under Section 28 of this Manual.

PHOSTOXIN tablets and pellets are supplied in gas-tight containers and their shelf life is unlimited as long as the packaging remains intact. Once opened for fumigation, the aluminum flasks of tablets or pellets may be tightly resealed and stored for future use. Storage and handling instructions will be given in detail under section 19.

**4. PRECAUTIONARY STATEMENTS**

**4.1 Hazards to Humans and Domestic Animals**

**DANGER:** Aluminum phosphide from PHOSTOXIN tablets, pellets or dust may be fatal if swallowed. Do not get in eyes, on skin or on clothing. Do not eat, drink or smoke while handling aluminum phosphide fumigants. If a sealed container is opened, or if the material comes into contact with moisture, water or acids, these products will release phosphine, which is an extremely toxic gas. If a garlic odor is detected, refer to the Industrial Hygiene Monitoring instructions found in section 15.6 of this manual for appropriate monitoring procedures. Pure phosphine gas is odorless; the garlic odor is due to a contaminant. Since the odor of phosphine may not be detected under some circumstances, the absence of a garlic odor does not mean that dangerous levels of phosphine gas are not present. Observe proper reentry procedures specified under section 15.4 in this labeling to prevent overexposure.

**4.2 Physical and Chemical Hazards**

Aluminum phosphide in tablets, pellets and partially spent dust will release phosphine if exposed to moisture from the air or if it comes into contact with water, acids and many other liquids. Since phosphine may ignite spontaneously at levels above its lower flammable limit of 1.8% v/v, it is important not to exceed this concentration. Ignition of high concentrations of phosphine can produce a very energetic reaction. Explosion can occur under these conditions and may cause severe personal injury. **Never allow the buildup of phosphine to exceed explosive concentrations.** Do not confine spent or partially spent aluminum phosphide fumigants as the slow release of phosphine from this material may result in formation of an explosive atmosphere. Aluminum phosphide tablets and pellets, outside their containers, should not be stacked or piled up or contacted with liquid water. This may cause a temperature increase, accelerate the rate of gas production and confine the gas so that ignition could occur.

It is preferable to open containers of aluminum phosphide products in open air as under certain conditions, they may flash upon opening. Containers may also be opened near a fan or other appropriate ventilation that will rapidly exhaust contaminated air. When opening, invert the container several times then point the container away from the face and body and slowly loosen the cap. Although the chances for a flash are very remote, never open these containers in a flammable atmosphere. These precautions will also reduce the fumigator's exposure to phosphine gas. Containers may be opened inside the structure to be fumigated provided worker's exposure to phosphine gas does not exceed allowable limits.

Pure phosphine gas is practically insoluble in water, fats and oils, and is stable at normal fumigation temperatures. However, it may react with certain metals and cause corrosion, especially at higher temperatures and relative humidities. Metals such as copper, brass and other copper alloys, and precious metals such as gold and silver are susceptible to corrosion by phosphine. Thus, small electric motors, smoke detectors, brass sprinkler heads, batteries and battery chargers, fork lifts, temperature monitoring systems, switching gears, communication devices, computers, calculators and other electrical equipment should be protected or removed before fumigation. Hydrogen phosphide will also react with certain metallic salts and, therefore, sensitive items such as photographic film, some inorganic pigments, etc., should not be exposed. Immediately after addition of tablets and pellets to the structure, turn off any lights and unessential electric equipment.

**PHOSTOXIN** Tablets and pellets are Restricted Use Pesticides due to the high acute inhalation toxicity of phosphine gas. Read and follow the label and the Applicator's Manual. The Manual contains complete instructions for the safe use of the pesticide. Additional copies of this Manual are available from:

DEGESCH AMERICA, INC.  
PO Box 116  
153 Triangle Drive  
Weyers Cave, VA 24486 USA  
Telephone: (540) 234-9281/ 1-800-330-2525  
Fax: 9540) 234-8225  
Internet: [www.degeschamerica.com](http://www.degeschamerica.com)  
E-mail: [degesch@degeschamerica.com](mailto:degesch@degeschamerica.com)

**5. PESTS CONTROLLED**

**PHOSTOXIN** has been found effective against vertebrate and the following insects and their preadult stages - that is, eggs, larvae and pupae:

- |                       |                     |                          |
|-----------------------|---------------------|--------------------------|
| almond moth           | European grain moth | Mediterranean flour moth |
| Angoumois grain moth  | flat grain beetle   | pink bollworm            |
| bean weevil           | fruit flies         | raisin moth              |
| bees                  | granary weevil      | red flour beetle         |
| cadelle               | greater wax moth    | rice weevil              |
| cereal leaf beetle    | hairy fungus beetle | rusty grain beetle       |
| cigarette beetle      | Hessian fly         | saw-toothed grain beetle |
| confused flour beetle | Indian meal moth    | spider beetles           |
| dermestid beetles     | Khapra beetle       | tobacco moth             |
| dried fruit beetle    | lesser grain borer  | yellow mealworm          |
| dried fruit moth      | maize weevil        | Africanized bees &       |
|                       | pea weevil          | honeybees infested       |
|                       |                     | with tracheal mites      |

- woodchucks
- yellowbelly marmots (rockchucks)
- prairie dogs (except Utah prairie dogs, Cynomys Parvidens)
- Norway rats
- Roof rats
- Mice
- Ground squirrels
- Moles
- Voles
- Pocket gophers
- chipmunks

Although it is possible to achieve total control of the listed burrowing and insect pests, this is frequently not realized in actual practice. Factors contributing to less than 100% control are leaks, poor gas distribution, unfavorable exposure conditions, etc. In addition, some insects are less susceptible to phosphine than others. If maximum control is to be attained, extreme care must be taken in sealing, higher dosages must be used, exposure periods lengthened, proper application procedures followed, and temperature and humidity conditions must be favorable.

**6. COMMODITIES, WHICH MAY BE FUMIGATED WITH PHOSTOXIN**

**PHOSTOXIN** may be used for the fumigation of listed raw agricultural commodities, animal feed and feed ingredients, processed foods, tobacco and certain other nonfood items when their commodity temperature is above 40°F (5°C).

**6.1 Raw Agricultural Commodities, Animal Feed and Feed Ingredients**

**PHOSTOXIN** tablets and pellets may be added directly to animal feed, feed ingredients and raw agricultural commodities stored in bulk. For these commodities not stored in bulk, **PHOSTOXIN** may be placed in moisture permeable envelopes, on trays, etc., and fumigated as with processed foods.

**Raw Agricultural Commodities and Animal Feed and Feed Ingredients Which May Be Fumigated with PHOSTOXIN**

- |                                |                |                       |
|--------------------------------|----------------|-----------------------|
| almonds                        | flower seed    | sesame seed           |
| animal feed & feed ingredients | grass seed     | seed & pod vegetables |
| barley                         | millet         | sorghum               |
| Brazil nuts                    | oats           | soybeans              |
| cashews                        | peanuts        | sunflower seeds       |
| cocoa beans                    | pecans         | triticale             |
| coffee beans                   | pistachio nuts | vegetable seed        |
| corn                           | popcorn        | walnuts               |
| cottonseed                     | rice           | wheat                 |
| dates                          | rye            |                       |
| filberts                       | safflower seed |                       |

**6.2 PROCESSED FOODS**

Processed foods may be fumigated with **PHOSTOXIN**. Under no condition shall any processed food or bagged commodity come in contact with **PHOSTOXIN** tablets, pellets or residual dust except that **PHOSTOXIN** may be added directly to processed brewer's rice, malt, and corn grits for use in the manufacture of beer.

**Processed Foods Which May Be Fumigated With DEGESCH PHOSTOXIN**

- processed candy and sugar
- cereal flours and bakery mixes
- cereal foods (including cookies, crackers, macaroni, noodles, pasta, pretzels, snack foods and spaghetti)
- processed cereals (including milled fractions and packaged cereals)
- cheese and cheese byproducts
- chocolate and chocolate products (such as assorted chocolate, chocolate liquor, cocoa, cocoa powder, dark chocolate coating and milk chocolate products)
- processed coffee
- corn grits
- cured, dried and processed meat products and dried fish
- dates and figs
- dried eggs and egg yolk solids
- dried milk, dried powdered milk, nondairy creamers and nonfat dried milk
- dried or dehydrated fruits (such as apples, dates, figs, peaches, pears, prunes, raisins, citrus and sultanas)
- processed herbs, spices, seasonings and condiments
- malt
- processed nuts (such as almonds, apricot kernels, brazil nuts, cashews, filberts, macadamia nuts, peanuts, pecans, pistachio nuts, walnuts and other processed nuts)
- processed oats (including oatmeal)
- rice (brewer's rice grits, enriched and polished,)
- soybean flour and milled fractions
- processed tea
- dried and dehydrated vegetables (such as beans, carrots, lentils, peas, potato

flour, potato products and spinach)  
yeast (including primary yeast)  
wild rice  
other processed foods

**6.3 Nonfood Commodities, Including Tobacco**

The listed nonfood items that may be fumigated with PHOSTOXIN Tablets, pellets or residual dust should not contact tobacco and certain other of the nonfood commodities.

**Nonfood Commodities, Which May Be Fumigated With PHOSTOXIN**

processed or unprocessed cotton, wool and other natural fibers or cloth,  
clothing  
straw and hay  
feathers  
human hair, rubberized hair, vulcanized hair, mohair  
leather products, animal hides and furs  
tobacco  
tires (for mosquito control)  
wood, cut trees, wood chips, wood and bamboo products  
paper and paper products  
dried plants and flowers  
seeds (such as grass seed, ornamental herbaceous plant seed and vegetable seed)  
other nonfood commodities

**7. EXPOSURE CONDITIONS**

The following table may be used as a guide in determining the minimum length of the exposure period at the indicated temperatures:

<u>Temperature</u>	<u>Minimum Exposure Periods for PHOSTOXIN</u>	
	<u>Pellets</u>	<u>Tablets</u>
40°F (5°C)	Do not fumigate	Do not fumigate
41°-53°F (5-12°C)	8 days (192 hours)	10 days (240 hours)
54°-59°F (12-15°C)	4 days (96 hours)	5 days (120 hours)
60°-68°F (16-20°C)	3 days (72 hours)	4 days (96 hours)
above 68°F (20°C)	2 days (48 hours)	3 days (72 hours)

The fumigation must be long enough so as to provide for adequate control of the insect pests that infest the commodity being treated. Additionally, the fumigation period should be long enough to allow for more or less complete reaction of PHOSTOXIN with moisture so that little or no unreacted aluminum phosphide remains. This will minimize worker exposures during further storage and/or processing of the treated bulk commodity as well as reduce hazards during the disposal of partially spent aluminum phosphide products remaining after space fumigations. The proper length of the fumigation period will vary with exposure conditions since, in general, insects are more difficult to control at lower temperatures, and the rate of phosphine gas production by PHOSTOXIN is lower at lower temperatures and humidity.

It should be noted that there is little to be gained by extending the exposure period if the structure to be fumigated has not been carefully sealed or if the distribution of gas is poor and insects are not subjected to lethal concentrations of phosphine. Careful sealing is required to ensure that adequate gas levels are retained and proper application procedures must be followed to provide satisfactory distribution of phosphine gas. Application of additional PHOSTOXIN is recommended if phosphine concentrations drop below an effective level. If reentry into the treated structure is required, follow

the requirements for manpower and respiratory protection usage found under section 10 in this manual. Some structures can only be treated when completely tarped while others cannot be properly sealed by any means and should not be fumigated. Exposure times must be lengthened to allow for penetration of gas throughout the commodity when fumigant is not uniformly added to the commodity mass, for example, by surface application or shallow probing. This is particularly important in the fumigation of bulk commodity contained in large storage areas.

Remember, exposure periods recommended in the table are minimum periods and may not be adequate to control all stored products pests under all conditions nor will they always provide for total reaction of **PHOSTOXIN**

It is permissible and often desirable to use a low-flow recirculation system for phosphine gas in certain bulk storages. This method may be used in ship's holds, various types of flat storage and vertical storage bins. Recirculation usually involves the application of fumigant to the surface of the commodity. The phosphine gas is then continuously or intermittently drawn out of the over space and blown into the bottom of the storage using specially designed low volume fans and ductwork. This method facilitates the quick and uniform penetration of phosphine throughout the commodity. In some instances a reduced dosage may be used. Please contact DEGESCH AMERICA, INC. if assistance is required in designing the recirculation system.

**8. DOSAGE RATE GUIDELINES**

**Allowable and Recommended Dosages Rates**

Phosphine is a mobile gas and will penetrate to all parts of the storage structure. Therefore, dosage must be based upon the total volume of the space being treated and not on the amount of commodity it contains. The same amount of **PHOSTOXIN** is required to treat a 30,000-bushel silo whether it is empty or full of grain unless, of course, a tarpaulin seals off the surface of the commodity. The following dosage ranges are recommended for bulk (per 1000 bushels) and space (per 1000 cu.ft.) fumigations:

**8.1 Maximum Allowable Dosage Guidelines for Fumigation with PHOSTOXIN**

<u>Product</u>	<u>per 1000 cu.ft.*</u>	<u>per 1000 bu.*</u>
Pellets	725	900
Tablets	145	180

\*NOTE: Maximum Dosage for dates, nuts & dried fruits is 200 pellets, 40 tablets/1000 cu. ft.; 250 pellets, 50 tablets/1000 bu.

**The above maximum dosages are not to be exceeded.** It is important to be aware that a shortened exposure period cannot be fully compensated for with an increased dosage of phosphine.

Somewhat higher dosages, not to exceed the maximum dosage, are usually recommended under cooler, drier conditions or where exposure periods are relatively short. However, the major factor in selection of dosage is the ability of the structure to hold phosphine gas during the fumigation. A good illustration of this point is comparison of the low dosages recommended to treat modern, well-sealed warehouses with the higher ranges used for poorly constructed buildings that cannot be sealed adequately. In certain other fumigations, proper distribution of insecticidal concentrations of phosphine gas reaching all parts of the structure becomes a very important factor in dose selection. An example where this may occur is in the treatment of grain stored in tall silos. Poor gas distribution frequently results when the fumigant is added on top of the grain. In such cases, use of a low flow recirculation system is recommended under these circumstances. Please contact DEGESCH AMERICA, INC. if assistance is required in designing the recirculation system.

**8.2 Recommended PHOSTOXIN Dosages for Various Types of Fumigation**

One (1) PHOSTOXIN tablet or five (5) PHOSTOXIN pellets will produce a concentration of 25 parts per million (ppm) of phosphine gas (PH<sub>3</sub>) in a volume of 1000 cubic feet (1 gram PH<sub>3</sub>/1000 cu.ft. is equivalent to 25 ppm.

Although it is permissible to use the maximum dosage listed above, the following recommended dosage ranges can be used as a guideline for various types of fumigation.

When a dosage range is recommended, use the higher rate under conditions of severe infestation, lower temperature and other applicable variables.

<u>Type of Fumigation</u>	<u>Dosage Range</u>	
	<u>Pellets</u>	<u>Tablets</u>
1. Vertical Storages (such as silos, concrete bins, steel bins, etc.)	200-400/1000 bu. 150-700/1000 cu.ft.	40-180/1000 bu. 30-140/1000 cu.ft.
2. Farm Bins (Butler Type)	450-900/1000 bu. 350-725/1000 cu.ft.	90-180/1000 bu. 70-145/1000 cu.ft.
3. Bulk stored commodities in flat storage, bunkers and commodities stored on ground loosely piled under gas tight covering.	450-900/1000 bu. 350-725/1000 cu.ft.	90-180/1000 bu. 70-145/1000 cu.ft.
4. Packaged commodities (bagged grain, process foods, etc.) in sealable enclosures.	150-450/1000 cu.ft.	30-90/1000 cu.ft.
5. Nuts, dates or dried fruit in storage boxes.	100-200/1000 cu.ft.	20-40/1000 cu.ft.
6. Nuts, dates or dried fruit in bulk.	125-250/1000 bu. 100-200/1000 cu.ft.	25-50/1000 bu. 20-40/1000 cu.ft.
7. Railcars, containers, trucks vans and other transport vehicles,	225-500/1000 cu.ft.	45-145/1000 cu.ft.
8. Space fumigation such as cereal mills, feed mills, food processing plants & warehouses	100-300/1000 cu.ft.	20-60/1000 cu.ft.
9. Stored Tobacco	100-250/1000 cu.ft	20-50/1000 cu.ft
10. Non-food products	150-450/1000 cu.ft	30-90/1000 cu.ft.
11. Stored beehives, supers and other beekeeping equipment for wax moth control and Africanized honeybees with tracheal mites and fowlbrood.	150-225/1000 cu.ft	30-45/1000 cu.ft
12. Barges	300-900/1000 bu. 250-725/1000 cu.ft.	60-80/1000 bu. 50-145/1000 cu.ft.

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13. Shipholds	200-400/1000 bu. 150-330/1000 cu.ft.	40-80/1000 bu. 30-66/1000 cu.ft.
14. Commodity in small containers	1-2 pellets per 10 cu.ft.	
15. Rodent burrows	10-20/per burrow	2-4/per burrow

Higher dosages are recommended in structures that are of loose construction and in the fumigation of bulk stored commodities in which diffusion will be slowed and result in poor distribution of phosphine gas

**9. PROTECTIVE CLOTHING**

**GLOVES:**

Wear dry gloves of cotton or other material if contact with tablets, pellets, or dust is likely.

Gloves should remain dry during use.

Wash hands thoroughly after handling aluminum phosphide products.

Aerate used gloves and other clothing that may be contaminated in a well-ventilated area prior to laundering.

**10. RESPIRATORY PROTECTION**

**10.1 When respiratory protection must be worn**

Respiratory protection approved by the National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA must be worn during exposure to concentrations in excess of permitted limits or when concentrations are unknown. Self-contained breathing apparatus (SCBA) must be worn during entry into sites that are under fumigation if the concentration of phosphine is unknown or known to exceed the STELs for phosphine (1 ppm for 15 minutes).

**10.2 Permissible gas concentration ranges for respiratory protection devices**

A NIOSH/MSHA approved full-face gas mask - phosphine canister combination may be used at levels up to 15 ppm or following manufacturers use conditions instructions for escape. Above 15 ppm or in situations where the phosphine concentration is unknown, a NIOSH/MSHA approved, SCBA must be worn. - The NIOSH/OSHA Pocket Guide DHHS (NIOSH) 97-140 or the NIOSH ALERT - Preventing Phosphine Poisoning and Explosions During Fumigation, lists these and other types of approved respirators and the concentrations limits at which they may be used.

**10.3 Requirements for availability of respiratory protection.**

If **PHOSTOXIN** is to be applied from within the structure to be fumigated, an approved full-face gas mask - phosphine canister combination or SCBA or its equivalent must be available at the site of application in case it is needed.

SCBA or its equivalent must be available locally (for example, at a fire station or rescue squad) if it is not available at the fumigation site.

Respiratory protection need not be available for applications from outside the area to be fumigated such as addition of tablets or pellets to automatic dispensing devices, outdoor applications, etc., if exposures above the permitted exposure limits will not be encountered.

If monitoring equipment is not available on a farm and application of



PHOSTOXIN fumigant cannot be made from outside the structure, an approved canister respirator must be worn during application from within the structure being treated. However, if entry into an on farm structure, that is under fumigation, is required SCBA must be worn if the gas concentration is unknown or above the permissible limits.

**11. Requirements for Certified Applicator to be present and responsible for all workers as follows:**

- A. A Certified Applicator must be physically present, responsible for, and maintain visual and/or voice contact with all fumigation workers during the application of the fumigant. Once the application is complete and the structure has been made secure the certified applicator does not need to be physically present at the site.
- B. A Certified Applicator must be physically present, responsible for and maintain visual and/or voice contact with all fumigation workers during the initial opening of the fumigation structure for aeration. Once the aeration process is secured and monitoring has established that aeration can be completed safely the certified applicator does not need to be physically present and trained person(s) can complete the process and remove the placards.
- C. Persons with documented training in the handling of Phosphine products must be responsible for receiving, aerating and removal of placards from vehicles, which have been fumigated in transit. Refer to section 12 for training requirements.

**12. TRAINING REQUIREMENTS FOR RECEIPT OF INTRANSIT VEHICLES UNDER FUMIGATION.**

The trained person(s) must be trained by a Certified Applicator following the EPA accepted product applicators manual that must precede or be attached to the outside of a transport vehicle; or by other training which is accepted by local and or state authorities. When training has been completed and the employee demonstrates safety knowledge proficiency, the training date must be logged and maintained in the employee's safety training record for a minimum of three years. Refresher training must be done on an annual basis.

This training must cover the following items, each of which may be found in this manual:

- a. How to aerate the vehicle and verify that it contains no more than 0.3-ppm phosphine.  
OR
- b. How to transfer the commodity to another storage area without prior aeration and ensure that worker safety limits are not being exceeded during the transfer.
- c. How to determine when respiratory protection must be worn.
- d. How to protect workers and nearby persons from exposure to levels above the 8-hour time weighted average (TWA) of 0.3 ppm or the 15 minute TWA short-term exposure limit (STEL) of 1.0 ppm phosphine.
- e. Proper removal of placards from the vehicle.
- f. How to follow proper residual disposal instruction.

**13. GAS DETECTION EQUIPMENT**

There are a number of devices on the market for the measurement of phosphine gas at both industrial hygiene and fumigation levels. Glass detection tubes used in conjunction with the appropriate hand-operated air sampling pumps are widely used. These devices are portable, simple to use, do not require extensive training and are relatively rapid, inexpensive and accurate. Electronic devices are also available for both low level and high phosphine gas readings. Such devices should be used in full compliance with manufacturers' recommendations.

**14. NOTIFICATION REQUIREMENTS**

**14.1 Authorities and on-site workers:**

As required by local regulations, notify the appropriate local officials (fire department, police department, etc.) of the impending fumigation. Provide to the officials an MSDS and an Applicator's Manual for the product and any other technical information deemed useful. Offer to review this information with the local official(s)

**14.2 Incidents involving these products:**

Registrants must be informed of any incident involving the use of this product. Please call (540) 234-9281 / 1-800-330-2525 so DEGESCH AMERICA, INC. can report the incident as per requirements of 40 CFR Part 159.

**14.3 Theft of products:**

Immediately report to the local police department thefts of metal phosphide fumigants.

**15. APPLICATOR AND WORKER EXPOSURE**

**15.1 Exposure Limits**

Exposures to phosphine must not exceed the 8-hour Time Weighted Average (TWA) of 0.3 ppm or the 15-minute Short-term Exposure limit (STEL) of 1.0-ppm phosphine. All persons are covered by these exposure standards.

**15.2 Application of Fumigant**

At least two persons, a certified applicator and trained person, or two trained persons under the direct supervision of the certified applicator must be present when entry into the structure for application of the fumigant is required. Depending upon temperature and humidity, PHOSTOXIN tablets and pellets release phosphine gas slowly upon exposure to moisture from the air. In most cases, this release is slow enough to permit applicators to deposit fumigant in the desired areas and then vacate the premises without significant exposure to the gas. If the fumigator's exposure will exceed the allowable limits, approved respiratory protection must be worn.

**15.3 Leakage from Fumigated Sites**

Phosphine gas is highly mobile and given enough time may penetrate seemingly gas-tight materials such as concrete and cinder block. Therefore, adjacent, enclosed areas likely to be occupied must be examined to ensure that significant leakage has not occurred. Sealing of the fumigated site and/or airflow in the occupied areas must be sufficient to bring down the phosphine concentration to a safe level of 0.3 ppm or below.

**15.4 Aeration and Reentry**

If the structure is to be entered after fumigation, it must be aerated until the level of phosphine gas is 0.3 ppm or below. The area or site must be monitored to ensure that liberation of gas from the treated commodity does not result in the development of unacceptable levels i.e., over industrial hygiene levels of phosphine. Do not allow reentry into treated structure by any person before the level of phosphine reaches 0.3 pm or below unless protected by an approved respirator.

**15.5 Handling Un-aerated Commodities**

Transfer of incompletely aerated commodity via bulk handling equipment such as augers, drag conveyors and conveyor belts to a new storage structure is permissible. A Certified Applicator is responsible for training workers who handle the transfer of incompletely aerated listed commodities, and appropriate measures must be taken (i.e., ventilation or respiratory protection) to prevent exposures from exceeding the exposure limits for phosphine. The new storage structure must be placarded if it contains more than 0.3ppm phosphine. If the fumigation structure must be entered to complete the transfer, at least two trained persons, wearing proper respiratory protection may enter the structure. A certified applicator must be physically present during the entry into the structure.

REMEMBER transporting containers or vehicles under fumigation over public roads is prohibited.

**15.6 Industrial Hygiene Monitoring**

Phosphine exposures must be documented in an operations log or manual at each fumigation area and operation where exposures may occur. Monitor airborne phosphine concentrations in all indoor areas to which fumigators and other workers have had access during fumigation and aeration. Perform such monitoring in workers' breathing zones. This monitoring is mandatory and is performed to determine when and where respiratory protection is required. Once exposures have been adequately characterized spot checks must be made, especially if conditions change significantly or if an unexpected garlic odor is detected or a change in phosphine level is suspected.

**15.7 Engineering controls and work practices**

If monitoring shows that workers may be exposed to concentrations in excess of the permitted limits, then engineering controls (such as forced air ventilation) and/or appropriate work practices must be used to reduce exposure to within permitted limits. In any case, appropriate respiratory protection must be worn if phosphine exposure limits are exceeded.

**16. PLACARDING OF FUMIGATED AREAS**

All entrances to the fumigated structure must be placarded. Placards must be made of substantial material that can be expected to withstand adverse weather conditions, and must bear the wording as follows:

1. The signal words DANGER/PELIGRO and the SKULL AND CROSSBONES symbol in red.
2. The statement "Structure and/or commodity under fumigation, DO NOT ENTER/NO ENTRE".
3. The Statement, "This sign may only be removed by a certified applicator or a person with documented training after the commodity is completely aerated (contains 0.3 ppm or less of phosphine gas). If incompletely aerated commodity is transferred to a new storage structure, the new structure must also be placarded if it contains more than 0.3 ppm.

Workers exposure during this transfer must not exceed allowable limits.

- 4. The date the fumigation begins.
- 5. Name and EPA registration number of fumigant used.
- 6. Name, address and telephone number of the Fumigation Company and/or applicator.
- 7. A 24-hour emergency response telephone number.

All entrances into a fumigated structure must be placarded. Where possible, placards should be placed in advance of the fumigation to keep unauthorized persons away. For railroad hopper cars, placards must be placed on both sides of the car near the ladders and next to the top hatches into which the fumigant is introduced.

Do not remove placards until the treated commodity is aerated down to 0.3-ppm phosphine or less. To determine whether aeration is complete, each fumigated structure or vehicle must be monitored and shown to contain 0.3 ppm or less phosphine gas in the air space around and, if feasible, in the mass of the commodity.

**17. SEALING OF STRUCTURE**

The structure to be fumigated must first be inspected to determine if it can be made sufficiently gas tight. Careful sealing is required so that adequate gas levels are retained. Turn off all ventilation, supply air, air conditioning, and any other air moving systems, which could negatively affect the fumigation. Thoroughly inspect the structure to be fumigated and seal cracks, holes and openings. These areas could include, but are not limited to: windows, doors, vents, chimneys, open pipes and structural flaws. Sealing techniques can vary, but most often include polyethylene sheeting, adhesive tapes and adhesive sprays. Expandable foam or caulking material can work well on structural flaws. Proper sealing will insure sufficient gas levels within the fumigated structure and will decrease the chance of unwanted exposures outside of the fumigated area.

As with all fumigations, it is required that sealing be inspected for leaks. If phosphine above 0.3 ppm is found in an area where exposure to workers or bystanders may occur, the fumigator, using proper respiratory protective equipment must attempt to seal the leak from the exterior of the structure. Failing this, the fumigators, following proper procedures to prevent accidental poisoning, may enter the structure and seal the leaks from the interior. If the concentration inside the structure has decreased below the target level as a result of the leakage, additional fumigant may be added following the sealing repairs.

DO NOT FUMIGATE A STRUCTURE THAT CANNOT BE SEALED SUFFICIENTLY GAS TIGHT.

**18. AERATION OF FUMIGATED COMMODITIES**

*As an alternative to the aeration time periods listed below each container of the treated commodity may be analyzed for residues using accepted analytical methods.*

**18.1 Foods and feeds**

Tolerances for phosphine residues have been established at 0.1 ppm for animal feeds and 0.01 ppm for processed foods. To guarantee compliance with these tolerances, it is necessary to aerate these commodities for a minimum of 48 hours prior to offering them to the end consumer.

**18.2 Non-food commodities**

Aerate all non-food commodities to 0.3 ppm or less of phosphine. Monitor densely packed commodities to ensure that aeration is complete.

**18.3 Tobacco**

Tobacco must be aerated for at least three days (72 hours) when fumigated in hogsheads or until concentration is below 0.3 ppm and for at least two days (48 hours) when fumigated in other containers. When plastic liners are used, longer aeration periods will probably be required to aerate the commodity down to 0.3 ppm. If residues are less than tolerance levels, the commodity may be shipped to the consumer regardless of the above holding periods.

**19. STORAGE INSTRUCTIONS**

PHOSTOXIN tablets/pellets must be stored in a dry, well-ventilated area away from heat, under lock and key. Post as a pesticide storage area. Do not contaminate food, water or feed by storing pesticides in the same areas used to store these commodities. Do not store in buildings where humans or domestic animals may reside. Keep out of reach of children.

**19.1 Labeling of Storage**

The labeling of the storage area should take into account the needs of a variety of organizations. These include, but are not be limited to: company policy, insurance carrier, Occupational Safety and Health Administration (OSHA), Emergency Planning and Community Right to Know and local emergency response professionals. At a minimum, the storage must be marked with the following signs and should be locked:

1. Danger, Poison (with skull and cross bones)
2. Authorized Personnel Only
3. National Fire Protection Association (NFPA) Hazard Identification Symbols for the pesticide.

The NFPA has developed Hazard Identification Symbols. This standardized system is designed to provide, at a glance the information regarding the health, fire and reactivity hazards associated with hazardous materials. The following are the hazard categories and degree of hazard for aluminum phosphide:

Category	Degree of Hazard
Health	4 (Severe Hazard)
Flammability	4 (Severe Hazard)
Reactivity	2 (Moderate)
Special Notice Key	W

NOTE: When using the NFPA Hazard Identification System, the characteristics of all hazardous materials stored in a particular area must be considered. The local fire protection district should be consulted for guidance on the selection and placement of such signs.

**20. TRANSPORTATION INSTRUCTIONS**

The United States Department of Transportation (DOT) classifies aluminum phosphide as Dangerous When Wet material and it must be transported in accordance with DOT regulations.

**20.1 Transport Designations** - The following transport designations apply to aluminum phosphide

Proper Shipping Name: Aluminum phosphide  
 Hazard Class: 4.3  
 Identification No.: UN 1397  
 Packing Group: PG I  
 Shipping Label: Dangerous When Wet/Poison  
 Shipping Placard: Dangerous When Wet

**20.2 Transportation Exemption:**

Exemption: DOT-E 10753

Purpose and Limitation: "...The motor vehicles used under the terms of this exemption are not required to be placarded..."

Modes of Transportation Authorized: Motor vehicle (Only private motor vehicles used in pest control operations are authorized to transport the packages covered by the terms of this exemption.)

NOTE: You must have a copy of this exemption with you during transportation. For a copy of this exemption contact: DEGESCH AMERICA, INC., 153 Triangle Drive, PO Box 116, Weyers Cave, VA 24486 USA; Telephone: (540) 234-9281/1-800-330-2525; Fax: (540) 234-8225 or Internet: [www.degeschamerica.com](http://www.degeschamerica.com)

**21. FUMIGATION MANAGEMENT PLAN**

The certified applicator is responsible for working with the owners and/or responsible employees of the structure and/or area to be fumigated to develop a Fumigation Management Plan (FMP). The FMP is intended to ensure a safe and effective fumigation. The FMP must address characterization of the structure and/or area, and include appropriate monitoring and notification requirements, consistent with, but not limited to, the following:

1. Inspect the structure and/or area to determine its suitability for fumigation.
2. When sealing is required, consult previous records for any changes to the structure, seal leaks, and monitor any occupied adjacent buildings to ensure safety.
3. Prior to each fumigation, review any existing FMP, MSDS, Applicators Manual and other relevant safety procedures with company officials and appropriate employees.
4. Consult company officials in the development of procedures and appropriate safety measures for nearby workers that will be in and around the area during application and aeration.
5. Consult with company officials to develop an appropriate monitoring plan that will confirm that nearby workers and bystanders are not exposed to levels above the allowed limits during application, fumigation and aeration. This plan must also demonstrate that nearby residents will not be exposed to concentrations above the allowable limits.
6. Consult with company officials to develop procedures for local authorities to notify nearby residents in the event of an emergency.
7. Confirm the placement of placards to secure entrance into any structure under fumigation.
8. Confirm the required safety equipment is in place and the necessary manpower is available to complete a safe and effective fumigation.
9. Written notification must be provided to the receiver of a vehicle that is fumigated in transit.

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These factors **must** be considered in putting a FMP together. It is important to note that some plans will be more comprehensive than others. All plans should reflect the experience and expertise of the applicator and circumstances at and around the structure and/or area.

In addition to the plan, the applicator must read the entire label and applicator manual and follow its directions carefully. If the applicator has any questions about the development of a FMP contact **DEGESCH AMERICA, INC.** for further assistance.

The FMP and related documentation, including monitoring records, must be maintained for a minimum of 2 years.

**GUIDANCE FOR PREPARATION OF A FUMIGATION MANAGEMENT PLAN**

Purpose

A Fumigation Management Plan (FMP) is an organized, written description of the required steps involved to help ensure a safe, legal and effective fumigation. It will also assist you and others in complying with pesticide product label requirements. The guidance that follows is designed to help assist you in addressing all the necessary factors involved in preparing for and fumigating a structure and/or area.

This guidance is intended to help you organize any fumigation that you might perform, **PRIOR TO ACTUAL TREATMENT**. It is meant to be somewhat prescriptive, yet flexible enough to allow the experience and expertise of the fumigator to make changes based on circumstances, which may exist in the field. By following a step-by-step procedure, which allow for flexibility, a safe and effective fumigation can be performed.

Before any fumigation begins, carefully read and review the label and the Applicator's Manual. This information must also be given to the appropriate company officials (supervisors, foreman, safety officer, etc.) in charge of the site. Preparation is the key to any successful fumigation. If you do not find specific instructions for the type of fumigation that you are to perform listed in this Guidance Document you will want to construct a similar set of procedures using this document as your guide or contact **DEGESCH AMERICA, INC.** for assistance. Finally, before any fumigation begins you must be familiar with and comply with all applicable federal, state and local regulations. The success of the fumigation is not only dependent on your ability to do your job but also upon carefully following all rules, regulations, and procedures required by governmental agencies.

**A CHECKLIST GUIDE FOR A FUMIGATION MANAGEMENT PLAN**

This checklist is provided to help you take into account factors that must be addressed prior to performing all fumigations. It emphasizes safety steps to protect people and property. The checklist is general in nature and cannot be expected to apply to all types of fumigation situations. It is to be used as a guide to prepare the required plan. Each item must be considered. However, it is understood that each fumigation is different and not all items will be necessary for each fumigation site.

**A. PRELIMINARY PLANNING AND PREPARATION**

- 1. Determine the purpose of the fumigation.
  - a. Elimination of insect infestation
  - b. Elimination of vertebrate pests

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c. Plant pest quarantine.

2. Determine the type of fumigation, for example

- a. Space; tarp, mill, warehouse, food plant, or outdoor area
- b. Vehicle; railcar, truck, van, container
- c. Commodity; raw agricultural or processed foods or non food
- d. Type of Storage vertical silo, farm storage, flat storage, etc.
- e. Vessels; ship or barge. In addition to the Applicator's Manual, read the US Coast Guard Regulation 46CFR 147A.

3. Fully acquaint yourself with the structure, and commodity to be fumigated, including.

- a. The general structure layout, construction (materials, design, age, maintenance), of the structure, fire or combustibility hazards, connecting structures and escape routes, above and below ground, and other unique hazards or structural characteristics. Prepare, with the owner/operator/person in charge, a drawing or sketch of structure to be fumigated, delineating features, hazards, and other structural characteristics.
- b. The number and identification of persons who routinely enter the area to be fumigated (ie. Employees, visitors, customers, etc.)
- c. The specific commodity to be fumigated, its mode of storage, and its condition.
- d. The previous treatment history of the commodity, if available.
- e. Accessibility of utility service connections.
- f. Nearest telephone or other means of communication. Mark the location of these items on the drawing/sketch.
- g. Emergency shut-off stations for electricity water and gas. Mark the location of these items on the drawing/sketch.
- h. Current emergency telephone numbers of local Health, Fire, Police, Hospital and Physician responders.
- i. Name and phone number (both day and night) of appropriate company officials.
- j. Check, mark and prepare the points of fumigant application locations if the job involves entry into the structure for fumigation.
- k. Review labeling and Applicator's Manual
- l. Exposure time considerations.
  - 1. Product (tablet and pellets) to be used.
  - 2. Minimum fumigation period, as defined and described by the label use directions.
  - 3. Down time required to be available
  - 4. Aeration requirements
  - 5. Cleanup requirements, including dry or wet deactivation methods, equipment, and personnel needs, if necessary.
  - 6. Measured and recorded commodity temperature and moisture.
- m. Determination of dosage
  - 1. Cubic footage or other appropriate space/location calculations.
  - 2. Structure sealing capability and methods.
  - 3. Label recommendations
  - 4. Temperature, humidity, wind
  - 5. Commodity/space volume
  - 6. Past history of fumigation of structure
  - 7. Exposure time.

**B. PERSONNEL**

- 1. Confirm in writing that all personnel in and around the structure and/or area to be fumigated have been notified prior to application of the fumigant. Consider using a checklist that each employee initials indicating they have been notified.



- 2. Instruct all fumigation personnel to read the Applicator's Manual concerning the hazards that may be encountered, the selection of personal protection devices, including detection equipment.
- 3. Confirm that all personnel are aware of and know how to proceed in case of an emergency situation.
- 4. Instruct all personnel on how to report any accident and/or incidents related to fumigant exposure. Provide a telephone number for emergency response reporting.
- 5. Instruct all personnel to report to proper authorities any theft of fumigant and/or equipment related to fumigation.
- 6. Establish a meeting area for all personnel in case of and emergency.

C. MONITORING

1. Safety

- a. Monitoring of phosphine concentrations must be conducted in areas to prevent excessive exposure and to determine where exposure may occur. Document where monitoring will occur.
- b. Keep a log or manual of monitoring records for each fumigation structure and/or area. This log must at a minimum contain the timing, number of readings taken and level of concentrations found in each location.
- c. When monitoring, document even if there is no phosphine present above the safe levels. In such cases, subsequent monitoring is not routinely required. However spot checks must be made occasionally, especially if conditions change significantly.
- d. Monitoring must be conducted during aeration and corrective action must be taken if gas levels exceed the allowed levels in an area where bystanders and/or nearby residents or domestic animals may be exposed.

2. Efficacy

- a. Phosphine readings should be taken from within the fumigated structure to insure proper gas concentrations. If the phosphine concentrations have fallen below the targeted level the fumigators, following proper entry procedures may reenter the structure and add additional product.
- b. All phosphine readings should be documented.

D. NOTIFICATION

- 1. Confirm the appropriate local authorities (fire departments, police departments, etc.) have been notified as per label instructions, local ordinances, or instructions of the client.
- 2. Prepare written procedure ("Emergency Response Plan"), which contains explicit instructions, names, and telephone numbers so as to be able to notify local authorities if phosphine levels are exceeded in an area that could be dangerous to bystanders and or domestic animals.
- 3. Confirm that the receiver of in transit vehicles under fumigation have been notified and are trained according to Section 12 of this applicator manual.

E. SEALING PROCEDURES

- 1. Sealing must be adequate to control the pests. Care should be taken to insure that sealing materials would remain intact until the fumigation is complete.
- 2. If the structure has been fumigated before, review the previous FMP for previous sealing information.
- 3. Make sure that construction/remodeling has not changed the building in a

manner that will effect the fumigation.

4. Warning placards must be placed on every possible entrance to the fumigation structure.

#### F. APPLICATION PROCEDURES & FUMIGATION PERIOD

1. Plan carefully and apply the fumigant in accordance with the label requirements.
2. When entering into the area under fumigation always work with two or more people under the direct supervision of a certified applicator wearing appropriate respirators.
3. Apply fumigant from the outside where appropriate.
4. Provide watchmen when the possibility of entry into the fumigation site by unauthorized persons cannot otherwise be assured.
5. When entering structures always follow OSHA rules for confined spaces.
6. Document that the receiver of vehicles fumigated in transit has been notified.
7. Turn off any electric lights in the fumigated area of the structure as well as all nonessential electrical motors.

#### G. POST-APPLICATION OPERATIONS

1. Provide watchmen when the fumigation structure cannot be secured from entry by unauthorized persons during the aeration process.
2. Aerate in accordance with structural limitations.
3. Turn on ventilating or aeration fans where appropriate.
4. Use a suitable gas detector before reentry into a fumigated structure to determine fumigant concentration.
5. Keep written records of monitoring to document completion of aeration.
6. Consider temperature when aerating.
7. Ensure that aeration is complete before moving a treated vehicle onto public roads.
8. Remove warning placards when aeration is complete.
9. Inform business/client that employees/other persons may return to work or otherwise be allowed to reenter the aerated structure.

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## 22. APPLICATION PROCEDURES

A FMP must be devised to cover application and exposure period, aeration and disposal of the fumigant so as to keep to a minimum any human exposure to phosphine and to help assure adequate control of the insect pests.

The following instructions are intended to provide general guidelines for typical fumigations sites.

### 22.1 Farm Bins:

Leakage is the single most important cause of failures in the treatment of farm storages. Since these storages are often small, they usually have a higher leakage area in proportion to their capacity. Most wooden storage structures are so porous that they cannot be successfully fumigated unless they are completely tarped. Do not fumigate a storage that will be entered by humans or animals prior to aeration. Do not fumigate areas which house sensitive equipment containing copper or other metals likely to be corroded by phosphine gas.

1. Read the label, Applicator's Manual, MSDS and related safety material.
2. Inspect the bin to determine if you can fumigate effectively.
3. If the bin is located in an area where nearby workers and/or

bystanders or domestic animals would be exposed to phosphine gas because of leakage from the bin:

- (i) Develop a monitoring procedure that will confirm if leakage from the bin is above the allowable limits in an area that would affect nearby workers or bystanders.
  - (ii) Advise local authorities when and where you will be fumigating. Provide and review with them the MSDS, Applicator's Manual and other relevant safety information.
4. If the bin is in an isolated area on private property (i) and (ii) above are not required.
  5. Seal the bin as tightly as possible. It is recommended that the surface of the grain be covered with poly after **PHOSTOXIN** has been applied. Tarping the grain surface will greatly reduce the leak rate of the gas as well as reduce the amount of **PHOSTOXIN** required. Only the volume below the tarp must be dosed. If not tarped, the entire volume of the storage must be treated, whether full or empty.
  6. Using the applicator's manual calculate the dosage of tablets or pellets to be applied based on type of structure, its sealing properties, content type, weather, and commodity temperature and moisture content of the commodity and length of fumigation.
  7. **PHOSTOXIN** tablets or pellets required for the fumigation may be scattered over the surface or probed into the grain using a rigid PVC pipe about 5 to 7 feet in length and having a diameter of 1-1/4 inches.
  8. Use about 20-50 tablets or 100-250 pellets per probe. Probe the dosage uniformly over the surface. Fumi-Sleeve® dust retainer or packaged fumigants may be used if dust-free applications are desired.
  9. Immediately cover the surface of the grain with a plastic tarpaulin.
  10. Place no more than 25 percent of the total dose at the bottom if the bin is equipped with aeration fans. **Caution:** Make sure that the aeration duct is dry before adding **PHOSTOXIN**. Addition of **PHOSTOXIN** to water in an aeration duct may result in a fire.
  11. Seal the aeration fan with 4-mil plastic sheeting.
  12. Place placards on all entrances to the bin and near the ladder.
  13. Following aeration of the bin, the surface of the grain may be sprayed with an approved protectant to discourage reinfestation.

**Note:** If monitoring equipment is not available on a farm and application cannot be done from outside of a structure, an approved canister respirator must be worn during application from within an enclosed indoor area.

#### **22.2 Flat storage**

Treatments of these types of storages often require considerable time and physical effort. Therefore, sufficient manpower should be available to complete the work rapidly enough to prevent excessive exposure to phosphine gas. Vent flasks outside the storage, conduct fumigations during cooler periods, and employ other work practices to minimize exposures. It is likely that respiratory protection will be required during application of fumigant to flat storages. Refer to the sections on Applicator and Worker

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Exposure and Respiratory Protection.

1. Inspect the site to determine its suitability for fumigation.
2. Determine if the structure is in an area where leakage during fumigation or aeration would adversely affect nearby workers or bystanders if concentrations were above the permitted exposure levels.
3. Develop an appropriate Fumigation Management Plan. (Refer to FMP guidelines.)
4. Consult previous records for any changes to the structure. Seal vents, cracks and other sources of leaks.
5. Using the applicators manual, determine the length of the fumigation and calculate the dosage of tablets or pellets to be applied based upon volume of the building, contents, air and/or commodity temperature and the general tightness of the structure.
6. Apply tablets or pellets by surface application, shallow probing, deep probing or uniform addition as the flat storage is filled.

Storages requiring more than 24 hours to fill should not be treated by addition of fumigant to the commodity stream as large quantities of phosphine may escape before the bin is completely sealed.

Probes should be inserted vertically at intervals along the length and width of the flat storage. Pellets or tablets may be dropped into the probe at intervals as it is withdrawn.

Surface application may be used if the bin can be made sufficiently gas tight to contain the fumigant gas long enough for it to penetrate the commodity. In this instance, it is advisable to place about 25 percent of the dosage in the floor level aeration ducts. Check the ducts prior to addition of PHOSTOXIN to make sure that they contain no liquid water.

7. Placement of plastic tarp over the surface of the commodity is often advisable, particularly if the overhead of the storage cannot be well sealed.
8. Lock all entrances to the storage and post fumigation warning placards.

**22.3 Vertical storages** (concrete upright bins and other silos in which grain can be rapidly transferred)

1. Inspect the site to determine its suitability for fumigation.
2. Determine if the structure is in an area where leakage during fumigation or aeration would expose nearby workers or bystanders to concentrations above the permitted levels.
3. Develop an appropriate Fumigation Management Plan. (Refer to FMP guidelines.)
4. Consult previous records for any changes to the structure. Close openings and seal cracks to make the structure as airtight as possible. Prior to the fumigation, seal the vents near the bin top, which connect to adjacent bins.
5. Using the applicator manual, determine the length of the fumigation and

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calculate the dosage of tablets or pellets to be applied based upon volume of the building, air and/or commodity temperature and the general tightness of the structure.

- 6. Tablets or pellets may be applied continuously by hand or by an automatic dispenser on the headhouse/gallery belt or into the fill opening as the commodity is loaded into the bin. An automatic dispenser may also be used to add **PHOSTOXIN** into the commodity stream in the up leg of the elevator.
- 8. Seal the bin deck openings after the fumigation has been completed.
- 9. Bins requiring more than 24 hours to fill should not be fumigated by continuous addition into the commodity stream. Probing, surface application, or other appropriate means may be employed to fumigate these bins. Exposure periods should be lengthened to allow for diffusion of gas to all parts of the bin if **PHOSTOXIN** has not been applied uniformly throughout the commodity mass.
- 9. Place warning placards on the discharge gate and on all entrances.

**22.4 Mills, food processing plants and warehouses**

- 1. Inspect the site to determine its suitability for fumigation.
- 2. Determine if the structure is in an area where leakage during fumigation or aeration would expose nearby workers or bystanders if concentrations were above the permitted exposure levels.
- 3. Develop an appropriate Fumigation Management Plan. (Refer to FMP guidelines.)
- 4. Using the applicators manual, determine the length of the fumigation and calculate the dosage of tablets or pellets to be applied based upon volume of the building, air and/or commodity temperature and the general tightness of the structure.
- 5. Read the directions found in 4.2 Physical and Chemical Hazards and remove or cover any of the listed items that can become damaged from exposure to phosphine gas.
- 6. Consult previous records for any changes in the structure. Carefully seal and placard the space to be fumigated.
- 7. Place trays or sheets of Kraft paper or foil, up to 12-sq. ft. (1.1 sq. M) in area, on the floor throughout the structure.
- 8. Spread **PHOSTOXIN** on the sheets at a density no greater than 30 tablets per sq. ft. or 75 pellets per sq. ft. This corresponds to slightly more than one-half flask of tablets or one-half flask of pellets per 3'x4' sheet. Check to see that **PHOSTOXIN** has not piled up and that it is spread out evenly to minimize contact between the individual tablets or pellets.
- 9. Turn off any lights within the treated area and shut off all electrical motors not essential to operations of the storage. Doors leading to the fumigated space must be closed, sealed, and placarded with warning

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signs.

- 10. Upon completion of the exposure period, windows, doors, vents, etc., should be opened and the fumigated structure allowed to aerate. The structure should not be entered without proper PPE unless gas readings have been taken and the concentration is below the allowable limits. Gas concentration readings may be taken using low-level detector tubes or similar devices to ensure safety of personnel who reenter the treated area.
- 11. Collect the spent PHOSTOXIN dust and dispose of it, with or without further deactivation. Refer to Disposal Instructions in this manual.
- 12. Remove fumigation warning placards from the aerated structure.

**22.5 Railcars, containers, trucks, vans, and other transport vehicles**

Railcars and containers, trucks, vans, and other transport vehicles shipped piggyback by rail may be fumigated intransit. However, the aeration of railcars, railroad boxcars, containers and other vehicles is prohibited enroute. It is not legal to move trucks, trailers, containers, vans, etc., over public roads or highways until they have been aerated.

Transport vehicles loaded with bulk commodities, to which PHOSTOXIN tablets or pellets may be added directly, are treated in essentially the same way as any other flat storage facility. PHOSTOXIN may be added as the vehicle is being filled, the dose may be scattered over the surface after loading has been completed or the tablets or pellets may be probed below the surface. Carefully seal any vents, cracks or other leaks, particularly if the fumigation is to be carried out in-transit. See Section 15 of this Applicator's Manual for recommendations on placarding.

*PHOSTOXIN Prepacs or Fumi-Cel® plates (not classified by UL) are recommended for the treatment of transport vehicles or similar storages containing processed foods for which no direct contact is allowed with tablets or pellets.*

The Shipper and/or the fumigator must provide written notification to the receiver of railcars, railroad boxcars, shipping containers and other vehicles, which have been, fumigated in-transit. A copy of the Applicator's Manual must precede or accompany all transportation containers or vehicles, which are, fumigated intransit. If the Applicator's Manual is sent with the transport vehicle it must be placed securely on the outside of the vehicle.

Proper handling of treated railcars at their destination is the responsibility of the consignee. Upon receipt of the railcar, railroad boxcars, shipping containers and other vehicles, a certified applicator and/or persons with documented authorized training must supervise the aeration process and removal of the placards.

**22.6 Tarpaulin and bunker fumigations**

Use of plastic sheeting or tarpaulins to cover commodities is one of the easiest and least expensive means for providing relatively gas tight enclosures which are very well suited for fumigation. Poly tarps are penetrated only very slowly by phosphine gas, and tight coverings are readily formed from the sheets. The volume of these enclosures may vary widely from a few cubic feet (for example, a fumigation tarpaulin placed over a small stack of bagged commodity) to a plastic bunker storage capable of holding 600,000 bushels of grain or more.

- 1. Develop an enclosure suitable for fumigation by covering bulk or packaged commodities with poly sheeting. The sheets may be taped together to provide a sufficient width of material to ensure that

adequate sealing is obtained. If the flooring upon which the commodity rests is of wood or other porous material, the commodity to be fumigated should be repositioned onto poly prior to covering for fumigation. The plastic covering of the pile may be sealed to the floor using sand or water snakes, by shoveling soil or sand onto the ends of the plastic covering or by other suitable procedures. The poly covering should be reinforced by tape or other means around any sharp corners or edges in the stack so as to reduce the risk of tearing. Thinner poly, about 2 mil, is suitable for most indoor tarp fumigations and for sealing of windows, doors and other openings in structures. However, 4 mil poly or thicker is more suitable for outdoor applications where wind or other mechanical stresses are likely to be encountered.

2. Determine if the enclosure is in an area where leakage during fumigation or aeration would affect nearby workers or bystanders.
3. Develop an appropriate Fumigation Management Plan. (Refer to the FMP guidelines.)
4. Using the guidance given under Section 6, Exposure Conditions, determine the length of the fumigation and calculate the dosage of tablets or pellets to be applied based upon volume of space under the tarp, air and or commodity temperature.
5. Tablets or pellets may be applied to the tarped stack or bunker storage of bulk commodity through slits in the poly covering. Probing or other means of dosing may be used. Avoid application of large amounts of **PHOSTOXIN** at any one point. The **PHOSTOXIN** should be added below the surface of the commodity if condensation or other source of moisture is likely to form beneath the poly. The slits in the covering should be carefully taped to prevent loss of gas once the dose has been applied and the introduction of water from rain. **PHOSTOXIN** Prepac's (not classified by UL) are recommended for the treatment of bagged commodities and processed foods although tablets and pellets on trays or sheets of Kraft paper may be used. Care should be taken to see that the poly is not allowed to cover the **PHOSTOXIN** and prevent contact with moist air or confine the gas.
6. Distribution of phosphine gas is generally not a problem in the treatment of bagged commodities and processed foods. However, fumigation of larger bunker storages containing bulk commodity will require proper application procedures to obtain adequate results.
7. Place warning placards at conspicuous points on the enclosure.

## 22.7 In transit Ship hold Fumigation

### 22.7.1 General Information

1. Important - Intransit ship or shiphold fumigation is also governed by U.S. Coast Guard Regulation 46 CFR 147A, Interim Regulations for Shipboard Fumigation. Refer to this regulation prior to fumigation. For further information contact:

Commandant  
U.S. Coast Guard  
Hazardous Materials Standards Division  
GMSO-3  
Washington, DC 20593-0001

**22.7.2 Pre-Voyage Fumigation Procedures**

1. Prior to fumigating a vessel for intransit cargo fumigation, the master of the vessel, or his representative, and the certified applicator 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 the vessel does not meet these requirements then the vessel must not be fumigated unless all crewmembers are removed from the vessel. The crewmembers are not permitted to reoccupy the vessel until it has been properly aerated and the master of the vessel and the certified applicator has made a determination that the vessel is safe for occupancy.
2. The certified applicator must notify the master of the vessel, or his representative, of the requirements relating to personal protection equipment\*, detection equipment, and that a person qualified in the use of this equipment must accompany any vessel containing 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.

*\*Note: Personal protection equipment means a NIOSH/MSHA approved respirator or gas mask fitted with an approved canister for phosphine. The canister is approved for use up to 15 ppm. SCBA or its equivalent must be used above 15 ppm or at unknown concentrations.*

3. Seal all openings to the cargo hold or tank and lock or otherwise secure all openings, manways, etc., which might be used to enter the hold. The overspace pressure relief system of each tank aboard tankers must be sealed by closing the appropriate valves and sealing the openings into the overspace with gas-tight materials.
4. Placard all entrances to the treated spaces with fumigation warning signs.
5. 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 at least two units of personal protection equipment and one phosphine gas detection device, and a person qualified in their operation be on board the vessel during the voyage.
6. During the fumigation, or until a manned vessel, leaves port or the cargo is aerated, the certified applicator shall ensure that a qualified person using phosphine gas detection equipment tests spaces adjacent to areas containing fumigated cargo as well as all regularly occupied 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 shall inform the master of the vessel, or his representative, of the leakage so that corrective action can be taken.
7. Review with the master, or his representative, the precautions and procedures to follow during the voyage of a ship hold in transit fumigation.

**22.7.3 Application Procedures for Bulk Dry Cargo Vessels and Tankers**

1. Apply tablets or pellets by scattering uniformly over the commodity surface, or they may be shallow or deep probed into the commodity mass. Fumi-Sleeves® or packaged metal phosphide products are recommended if dust free applications are required.
2. Immediately after application of the fumigant, close and secure all



hatch covers, tank tops, butterworth valves, manways, etc.

#### **22.7.4 In transit Fumigation of Transport Units (Containers) Aboard Ships**

In transit fumigation of transport units on ships is also governed by DOT RSPA 49 CFR 176.76(h) Transport Vehicles, Freight Containers, and Portable Tanks Containing Hazardous Materials and International Maritime Dangerous Goods Code P9025-1 Amdt. 27-94.

Application procedures for fumigation of raw commodities or processed foods in transport units (containers) are described in Section 22.5 of this manual.

#### **22.7.5 Precautions and Procedures During Voyage**

1. Using appropriate gas detection equipment, monitor spaces adjacent to areas containing fumigated cargo and all regularly occupied areas for fumigant leakage. If leakage is detected, the area should be evacuated of all personnel, ventilated, and action taken to correct the leakage before allowing the area to be occupied.
2. Do not enter fumigated areas except under emergency conditions. If necessary to enter a fumigated area, appropriate personal protection equipment must be used (see below). Never enter fumigated areas alone. At least one other person, wearing personal protection equipment, should be available to assist in case of an emergency.

#### **22.7.6 Precautions and Procedures During Discharge**

1. If necessary to enter holds prior to discharge, test spaces directly above grain surface for fumigant concentration, using appropriate gas detection and personal safety equipment. Do not allow entry to fumigated areas without personal safety equipment, unless fumigant concentrations are at safe levels, as indicated by a suitable detector.

### **23. BARGES**

Barge fumigation is also regulated by U. S. Coast Guard Regulation 46 CFR 147A as modified by U. S. Coast Guard Special Permit 2-75. This permit, which must be obtained prior to the fumigation, is available from:

Commandant  
U. S. Coast Guard  
Hazardous Materials Standards Div.  
GMSO-3  
Washington, DC 20593-0001

Leaks are a common cause of failures in the treatment of commodities aboard barges. Carefully inspect all hatch covers prior to application of PHOSTOXIN and seal, if necessary. Placard the Barge. Notify consignee if the barge is to be fumigated in transit and provide safety instructions for receipt and unloading.

### **24. SMALL SEALABLE ENCLOSURES**

Excellent results may be attained in the treatment of small enclosures since it is often possible to control the temperature during fumigation and also to make the enclosure virtually gas tight. Take care not to overdose during these fumigations. A single PHOSTOXIN pellet will treat a space of from 1.4 to 10 cubic feet. A single PHOSTOXIN tablet from 6.9 to 50 cubic feet.

### **25. BEEHIVES, SUPERS AND OTHER BEE KEEPING EQUIPMENT**

PHOSTOXIN tablets and pellets may be used for the control of the

Greater wax moth in stored beehives, supers, and other bee keeping equipment and for the destruction of bees, Africanized bees, and diseased bees including those infested with tracheal mites and foulbrood. The recommended dosage for this use is 30-45 tablets or 150-225 pellets per 1000 cubic feet.

Fumigations may be performed in chambers at atmospheric pressure, under tarpaulins, etc., by placing the tablets or pellets on trays or in moisture permeable envelopes. Do not add more than 2 tablets or 10 pellets to each envelope. Honey from treated hives or supers may only be used for bee food.

## **26. BURROWING PEST CONTROL**

### **26.1 Use Restrictions**

This product may be applied to underground burrow systems located in noncrop areas, crop areas, or orchards occupied by woodchucks, yellowbelly marmots (rockchucks), prairie dogs (except Utah prairie dogs, Cynomys Parvidens), Norway rats, roof rats, mice, ground squirrels, moles, voles, pocket gophers, and chipmunks.

All treatments for control of these species in burrows must be made outdoors. Tablets or pellets must be applied directly to underground burrow systems. Before using PHOSTOXIN tablets or pellets for burrowing pest control, read the applicable restrictions under Environmental Hazards, Endangered Species and Special Local Restrictions below.

This product may be used out of doors only for control of burrowing pests. THIS PRODUCT MUST NOT BE APPLIED INTO A BURROW SYSTEM THAT IS WITHIN 15 FEET (5 METERS) OF A BUILDING THAT IS, OR MAY BE, OCCUPIED BY HUMANS, AND/OR ANIMALS ESPECIALLY RESIDENCES. Document any burrows that open under or into occupied buildings, and do not apply to these burrows. In addition, check for any other source through which the gas may enter into occupied buildings as a result of application to burrows. If there is any way gas can move through pipes, conduits etc from burrows do not treat these burrows. Prior to treating a rodent burrow on a property containing an inhabited structure, the applicant must provide the customer (e.g. tenant, homeowner, or property manager) with a MSDS or appropriate sections of the Applicator's Manual.

**26.2 Application Directions** - Use application procedures appropriate to the type of burrow system being treated. DOSAGE RATES MUST NOT BE EXCEEDED UNDER ANY CIRCUMSTANCES.

**26.2.1 For species with open burrow systems, locate all entrances to each burrow system.** Treatment of more than one entrance in a system is often desirable as systems often overlap and are not defined. Treat all entrances except for those entrances you are sure connect to already treated entrances. Insert 2 to 4 tablets or 10 to 20 pellets into each entrance to be treated. Use the lower rates for smaller burrows and/or when soil moisture is high. Use the higher rates for larger burrow systems and when soil moisture is relatively low. Pack each treated entrance with crumpled paper and shovel soil to completely cover the paper. Using crumpled paper will prevent soil from covering the tablets or pellets and slowing down their action. Rocks, clods of soil, cardboard etc. may be used for this purpose. Be sure to seal all untreated entrances by shoveling and packing soil and/or sod to completely seal the opening.

Inspect treated areas 1 or 2 days following treatment for signs of residual activity of target species. Treat all reopened burrows in the same manner prescribed above.

**26.2.2 For species with closed burrow systems, (pocket gophers, and moles in some situations);** locate the main underground runway by probing with a smooth-sided rod 12 to 18 inches from a fresh mound. For pocket gophers, begin probing on the flat side of the mound. A sudden reduction in soil resistance

to the probe indicates that the main runway has been located. Once the main runway is located, remove the probe and apply 2 to 4 tablets or 10 to 20 pellets through the probe hole. Adjust treatment rate according to the level of soil moisture, using more tablets or pellets if the soil is relatively dry.

Do not treat if soil is extremely dry or if there are no signs of recent gopher or mole activity. Make a tight seal to close probe hole by using a clod of soil or a sod plug to cover the hole or by using the heel of your shoe to push sod and/or soil over the surface opening. If the probe hole is more than one inch in diameter, place crumpled paper in the hole before closing it with soil and/or sod. Two days after treatment, you may check area for residual pest activity by poking holes in main runways of burrow systems, flagging holes and inspecting them two days later. You should retreat all reclosed systems, on both sides of the plug.

**26.3 Environmental Hazards**

This product is very highly toxic to wildlife. Many non-target organisms exposed to phosphine gas in burrows will be killed. Do not apply directly to water or wetlands (swamps, bogs, marshes, and potholes). Do not contaminate water by cleaning of equipment or disposal of wastes.

**26.4 Endangered Species Restrictions**

The use of **PHOSTOXIN** in a manner that may kill or otherwise harm an endangered or threatened species or adversely modify their habitat is a violation of Federal laws. Before using this pesticide on range and/or pastureland you must obtain the PESTICIDE USE BULLETIN FOR PROTECTION OF ENDANGERED SPECIES for the county in which the product is to be used. The bulletin is available from your County Extension Agent, State Fish and Game Office, or your pesticide dealer. Use of this product in a manner inconsistent with the PESTICIDE USE BULLETIN FOR PROTECTION OF ENDANGERED SPECIES is a violation of Federal laws.

Even if applicable county bulletins do not prohibit the use of this product at the intended site of application, you may not use this product for control of prairie dogs in the states of Arizona, Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah or Wyoming unless a pre-control survey has been conducted. Contact the nearest U. S. Fish and Wildlife Service Endangered Species Specialist to determine survey requirements in your area. This survey must be in compliance with the Black-Footed Ferret Survey Guidelines, developed by the U.S. Fish and Wildlife Service, and a determination must be made in accordance with the Guidelines that black-footed ferrets are not present in the treatment area.

**CALIFORNIA (all endangered species)**

Fresno, Inyo, Kern, Kings, Madera, Merced, Monterey, San Benito, San Luis Obispo, Santa Barbara, Stanislaus and Tulare

See the U.S. EPA Interim Measurers Bulletin for your county. To obtain a copy of the bulletin, contact your county agricultural commissioner or visit the following website: <http://www.cdpr.ca.gov/docs/es/index.htm> If there is no current bulletin available for your county, contact the U.S. Fish and Wildlife Service office in Portland, OR, to determine whether there are endangered species that might be adversely affected by your proposed use of **PHOSTOXIN®** and the steps you should take to mitigate any such risks.

**FLORIDA**

Statewide

**GEORGIA** Appling, Atkinson, Bacon, Baker, Ben Hill, Bleckley, Berrien, Brantley, Brooks, Bryan, Bullock, Calhoun, Camden, Chandler, Charlton, Chatham, Clinch, Coffee, Colquitt, Cook, Crisp, Decatur, Dodge, Dooly, Dougherty, Early, Echols, Effingham, Emanuel, Evans, Glynn, Grady, Irwin, Jeff Davis, Jenkins, Johnson, Lanier, Laurens, Lee, Liberty, Long, Lowndes, Macon, McCintosh, Miller, Mitchell, Montgomery, Pierce, Pulaski, Screven, Seminole, Telfair, Tattnall, Thomas, Tift, Toombs, Treutlen, Turner, Ware, Wayne, Wheeler, Wilcox and Worth.

**NEW MEXICO**

Hidalgo

**UTAH**

Beaver, Garfiled, Iron, Kane, Piute, Sevier, Washington and Wayne

**WYOMING**

Albany

**26.4.1 Special Local Restrictions**

**1. NORTH CAROLINA**

PHOSTOXIN tablets and pellets may only be used for control of rats and mice in the state of North Carolina. Use against other burrowing (not insect pests) pests is not permitted.

**2. OKLAHOMA**

A special permit for black-tailed prairie dog control by poisoning is required in Oklahoma. Contact the Oklahoma State Department of Wildlife Conservation to obtain this permit.

**3. WISCONSIN**

A state permit is required for use of pesticides in Wisconsin to Control small mammals, except rats or mice. Please contact your local Department of Natural Resources office for information.

**4. INDIANA**

Use of PHOSTOXIN tablets or pellets for mole control is not legal in the state of Indiana.

**5. MISSOURI**

A state permit is required for use of pesticides in Missouri to control small mammals, except rats and mice. Please contact the Missouri Department of Conservation office for information.

**6. KANSAS**

A special permit for black-tailed prairie dog control by poisoning is required in Kansas. Contact the Kansas Fish and Game Commission to obtain this permit.

**7. CALIFORNIA**

Use of PHOSTOXIN tablets and pellets for chipmunk control is not legal in the state of California.

**27. FUMI-SLEEVE® DUST RETAINER METHOD OF FUMIGATION - patent no. 4,579,417 & 4,641,573**

The FUMI-SLEEVE Dust Retainer is a cotton sleeve designed to slip over the standard 1-1/4 " PVC probe. Contact DEGESCH AMERICA, INC. for more information regarding these sleeves.

The presence of residual dust from spent PHOSTOXIN tablets or pellets in treated raw agricultural commodities normally presents no problems of toxicity or sanitation. Nevertheless, where it is specified that no tablets or pellets can be placed directly into the commodity during fumigation, conduct the fumigation in the normal manner following the directions below:

1. Determine the structure can be made sufficiently tight by sealing all vents, windows, cracks or other openings.
2. Determine if the structure is in an area where leakage during fumigation or aeration would affect nearby workers or bystanders if concentrations were above the permitted exposure levels.
3. Develop an appropriate Fumigation Management Plan. (Refer to Fumigation Management Plan guidelines.)
4. Using the applicators manual, determine the dosage and

- appropriate number of probings to be used.
- 5. The FUMI-SLEEVE dust retainer is slipped over the standard 1-1/4" PVC probe.
- 6. The probe with dust retainer is then inserted into the commodity.
- 7. As the probe is withdrawn, leaving the dust retainer in the commodity the appropriate number of tablets or pellets is poured into the probe.
- 8. After the probe is completely removed, leaving the dust retainer containing the tablets or pellets in the commodity, tie off the top of the retainer in a common overhand knot. If probing is not required the closed sleeve may be placed on the surface of the commodity.
- 9. Post the structure (ship hold, barge, container on the ship, railcar, other piggyback structure) with appropriate warning signs as well as a sign showing the number of FUMI-SLEEVE dust retainers used.
- 10. On completion of fumigation remove all retainers from the treated commodity and transport in a well-ventilated container to disposal site.
- 11. Disposal
  - a. The entire dust retainer and residue can be buried following disposal instructions found elsewhere in this manual.
  - b. Or the residual dust may be emptied from the sleeve and disposed of according to instructions found under disposal instructions in section 28.3 of this manual.
  - c. It is not recommended that you reuse the sleeve.

**28. DISPOSAL INSTRUCTIONS**

**28.1 General**

Do not contaminate water, food or feed by storage or disposal.

Unreacted or partially reacted **PHOSTOXIN** is acutely hazardous. Improper disposal of excess pesticide is a violation of Federal Law. If these wastes cannot be disposed of by use according to applicators manual instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance. For specific instructions, see Section 29 of this manual, Spill and Leak Procedures.

Some local and state waste disposal regulations may vary from these general recommendations. Disposal procedures should be reviewed with appropriate authorities to ensure compliance with local regulations. Contact your state Pesticide or Environmental Control Agency or Hazardous Waste Specialist at the nearest EPA Regional Office for guidance.

Triple rinse flasks and stoppers with water. They may then be recycled or reconditioned, or punctured and disposed of in a sanitary landfill, or by other procedures approved by state and local authorities. Rinsate may be disposed of in a sanitary landfill by pouring it out onto the ground or by other approved procedures. It is also permissible to remove lids and expose empty flasks to atmospheric conditions until residue in the flasks is reacted. In this case puncture and dispose of in a sanitary landfill or other approved site, or by other procedures approved by state and local authorities.

If properly exposed, the residual dust remaining after fumigation with **PHOSTOXIN** will be a grayish-white powder. This will be a nonhazardous waste

and contain only a small amount of unreacted aluminum phosphide. However, residual dust from incompletely exposed **PHOSTOXIN** (so called green dust) requires special care.

**28.2. DIRECTIONS FOR DEACTIVATION OF PARTIALLY SPENT RESIDUAL DUST FROM PHOSTOXIN**

Partially spent dust must be deactivated further prior to ultimate disposal. This is especially true in cases of incomplete exposure that has resulted in so-called "green dust" or following a fumigation that has produced large quantities of partially spent material.

**Residual dust from PHOSTOXIN may be deactivated as follows using the "Wet Method."**

Deactivating solution is prepared by adding the appropriate amount of low sudsing detergent or surface-active agent to water in a drum or other suitable container. A 2% solution (or 4 cups in 30 gallons) of detergent is suggested. The container should be filled with deactivating solution to within a few inches of the top.

Residual dust is poured slowly into the deactivating solution and stirred so as to thoroughly wet all of the particles. This should be done in the open air and not in the fumigated structure. Dust from **PHOSTOXIN** tablets or pellets should be mixed into no less than about 10 gallons of water-detergent solution for each case of material used. Wear appropriate respiratory protection during wet deactivation of partially spent dust. Do not cover the container being used for wet deactivation.

Dispose of the deactivated dust-water suspension, with or without preliminary decanting, at a sanitary landfill or other suitable site approved by local authorities. Where permissible, the slurry may be poured out onto the ground. If the slurry has been held for 36 hours or more, it may be poured into a storm sewer.

**Caution:** - Wear a NIOSH/MSHA approved full-face gas mask - phosphine canister combination if exposed to levels between 0.3 ppm to 15 ppm or a Self Contained Breathing Apparatus (SCBA) if exposure is unknown or above 15 ppm during wet deactivation of partially spent material. Do not cover the container being used for wet deactivation. Do not dispose of **PHOSTOXIN** dust in a toilet.

Residual dust from **PHOSTOXIN** may also be deactivated as follows using the "Dry Method."

Extension of the fumigation period is the simplest method for further deactivation of "green" or partially spent dust prior to ultimate disposal.

Small amounts of partially spent dust, from 2 to 3 kg (4 to 7 lbs.) may be further deactivated by storage in a 1-gallon bucket. Larger amounts of dust (about 11 kg or 25 lbs.) may be held for deactivation in porous cloth bags (burlap, cotton, etc.). **Caution:** Transport these bags in open vehicles. Do not pile up the bags. Do not store "green dust" in bags.

**28.3 DIRECTIONS FOR DISPOSAL OF RESIDUAL DUST FROM PHOSTOXIN**

Confinement of partially spent residual dust (as in a closed container) or collection and storage of large quantities of dust may result in a fire hazard. Small amounts of phosphine may be given off from unreacted aluminum phosphide and confinement of the gas may result in a flash.

In open areas, small amounts of residual dust, up to about 5 to 8 kg may be disposed of on site by burial or by spreading over the land surface away from inhabited buildings.

Spent residual dust from **PHOSTOXIN** may also be collected and disposed of at a sanitary landfill, incinerator or other approved sites or by other procedures approved by Federal, State or Local authorities. "Green dust" must

be further deactivated before disposal at a landfill.

From 2 to 3 kg (4 to 7 lbs.) of spent dust from 2 to 3 flasks of **PHOSTOXIN** may be collected for disposal in a 1-gallon bucket. Larger amounts, up to about one-half case, may be collected in burlap, cotton or other types of porous cloth bags for transportation in an open vehicle to the disposal site. Do not collect dust from more than 7 flasks of tablets or 10 flasks of pellets (about 11 kg or 25 lbs.) in a single bag. Do not pile cloth bags together. Do not use this method for partially spent or "green" dust. **Caution: Do not collect dust in large drums, dumpsters, plastic bags or other containers where confinement may occur.**

**29. SPILL AND LEAK PROCEDURES**

**29.1 General Precautions and Directions**

A spill, other than incidental to application or normal handling, may produce high levels of gas and, therefore, attending personnel must wear SCBA or its equivalent when the concentration of phosphine gas is unknown. Other NIOSH/MSHA approved respiratory protection may be worn if the concentration is known. Do not use water at any time to clean up a spill of **PHOSTOXIN**. Water in contact with unreacted tablets or pellets will greatly accelerate the production of phosphine gas that could result in a toxic and/or fire hazard. Wear dry gloves of cotton or other material when handling aluminum phosphide.

Return all intact aluminum flasks to fiberboard cases or other packaging which has been suitably constructed and marked according to DOT regulations. Notify consignee and shipper of damaged cases.

If aluminum flasks have been punctured or damaged so as to leak, the container may be temporarily repaired with aluminum tape or the **PHOSTOXIN** may be transferred from the damaged flask to a sound metal container, which should be sealed and properly labeled as aluminum phosphide. Transport the damaged containers to an area suitable for pesticide storage for inspection. Further instructions and recommendations may be obtained, if required, from **DEGESCH AMERICA, INC.**

If a spill has occurred which is only a few minutes old, collect the tablets and pellets and place them back into the original flasks, if they are intact, and stopper tightly. Place the collected tablets and pellets in a sound metal container if the original flasks are damaged. Caution, these flasks may flash upon opening at some later time.

If the age of the spill is unknown or if the tablets and pellets have been contaminated with soil, debris, water, etc., gather up the spillage and place it into small open buckets having a capacity no larger than about 1 gallon. Do not add more than about one flask of spilled material, 1 to 1.5 kg (2 to 3 lbs.), to the bucket. If on-site, wet deactivation is not feasible, these open containers should be transported in open vehicles to a suitable area. Wet deactivation may then be carried out as described in 29.2. Alternatively, small amounts of spillage from 4 to 5 flasks (4 to 8 kg, 9 to 18 lbs.) may be spread out in an open area away from inhabited buildings to be deactivated by atmospheric moisture.

**29.2 Directions for deactivation by the wet method**

If the contaminated material is not to be held until completely reacted by exposure to atmospheric moisture, deactivate the product by the "Wet Method" as follows:

Deactivating solution is prepared by adding low sudsing detergent or surface-active agent to water in a drum or other suitable container. A 2% solution or 4 cups in 30 gallons is suggested. The container should be filled with deactivating solution to within a few inches of the top.

The tablets or pellets should be poured slowly into the deactivating solution and stirred so as to thoroughly wet all of the **PHOSTOXIN**. This should be done in the open air. **PHOSTOXIN** tablets or pellets should be mixed into no less than about 10 gallons of water-detergent solution



for each case of material. Wear appropriate respiratory protection during wet deactivation.

Allow the mixture to stand, with occasional stirring, for about 36 hours. The resultant slurry will then be safe for disposal.

Dispose of the slurry of deactivated material, with or without preliminary decanting, at a sanitary landfill or other suitable site approved by local authorities. Where permissible, this slurry may be poured into a storm sewer or out onto the ground.

**Caution:** - If worker protection standards will be exceeded during wet deactivation of unexposed or incompletely exposed **PHOSTOXIN**, NIOSH/MSHA approved respiratory protection must be worn. Wear a full-face gas mask - phosphine canister combination if exposed to levels between 0.3 ppm to 15 ppm or a Self Contained Breathing Apparatus (SCBA) if exposure is unknown or above 15 ppm. Never place tablets, pellets, or dust in a closed container such as a dumpster, sealed drum, plastic bag, etc., as flammable concentrations and a flash of phosphine gas are likely to develop.

The EPA has determined that proper disposal of aluminum phosphide will cause no unreasonable adverse effects to the environment.

**FOR ASSISTANCE, CONTACT:**

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CLASSIFIED BY UNDERWRITERS LABORATORIES, INC., AS TO FIRE HAZARD ONLY WHEN USED SPECIFICALLY AS DIRECTED IN THE MANUFACTURER'S INSTRUCTIONS. PHOSTOXIN® TABLETS AND PELLETS ARE NONCOMBUSTIBLE, BUT EXPOSURE TO MOIST AIR OR WATER RELEASES FLAMMABLE AND TOXIC PHOSPHINE (HYDROGEN PHOSPHIDE) GAS. SPONTANEOUS IGNITION MAY RESULT IF CONTACTED BY WATER, ACIDS, OR CHEMICALS.

~~January 17, 2002/BJL/PSI~~  
~~September 11, 2002/PSI/BJL~~  
~~September 19, 2002/PSI/BJL~~  
~~September 20, 2002/PSI/BJL~~  
~~December 9, 2002/PSI/BJL~~  
~~January 18, 2003/BJL/PSI~~  
~~January 27, 2003/BJL/PSI~~  
~~May 7, 2003/BJL/PSI~~  
~~May 9, 2003/BJL/PSI~~  
May 15, 2003/BJL/PSI