RESTRICTED USE PESTICIDE

DUE TO ACUTE INHALATION TOXICITY OF
HIGHLY TOXIC HYDROGEN PHOSPHIDE
(PHOSPHINE, PH_3) GAS

For retail sale to and use only by certified applicators for those uses covered by the applicator's certification or persons trained in accordance with the Applicator's Manual working under the direct supervision and in the physical presence of the certified applicator. Physical presence means on site or on the premises. Read and follow the label and the DEGESCH America, Inc. Applicator's Manual which contains complete instructions for the safe use of this pesticide.

APPLICATOR'S MANUAL

FOR

DEGESCH PHOSTOXIN®

PELLETS AND TABLETS-R

EPA Reg. No. 40285-3 EPA Reg. No. 40285-1

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

Active Ingredient: Aluminum Phosphide.....55%
Other Ingredients.....45%

KEEP OUT OF REACH OF CHILDREN

DANGER - POISON – PELIGRO

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.)

STATEMENT OF PRACTICAL TREATMENT

Symptoms of overexposure are headaches, dizziness, nausea, difficult breathing, vomiting, and diarrhea. In all cases of overexposure get medical attention immediately. Take victim to a doctor or emergency treatment facility.

If the gas or dust from aluminum phosphide is inhaled:
Get exposed person to fresh air. Keep warm and make sure person can breathe freely. If breathing has stopped, give artificial respiration by mouth-to-mouth or other means of resuscitation. Do not give anything by mouth to an unconscious person.

If aluminum phosphide pellets, tablets or powder are swallowed:
Drink or administer one or two glasses of water and induce vomiting by touching back of throat with finger, or if available, syrup of ipecac. Do not give anything by mouth if victim is unconscious or not alert.

If powder or granules of aluminum phosphide get on skin or clothing:
Brush or shake material off clothes and shoes in a well ventilated area. Allow clothes to aerate in a ventilated area prior to laundering. Do not leave contaminated clothing in occupied and/or confined areas such as automobiles, vans, motel rooms, etc. Wash contaminated skin thoroughly wtih soap and water.

If dust from pellets or tablets gets in eyes:
Flush with plenty of water. Get medical attention.

DEGESCH AMERICA, INC.
Weyers Cave, Virginia 24486 - USA - Telephone (540) 234-9281
EPA Est. No. 40285-VA-01
EPA Reg. No. 40285-1 and 40285-3

Form 17828 (R 2/99)

THIS PRODUCT IS ACCOMPANIED BY AN APPROVED LABEL AND APPLICATOR'S MANUAL. READ AND UNDERSTAND THE ENTIRE LABELING. ALL PARTS OF THE LABELING ARE EQUALLY IMPORTANT FOR SAFE AND EFFECTIVE USE OF THIS PRODUCT. CALL DEGESCH AMERICA, INC., OR EPA IF YOU HAVE ANY QUESTIONS OR DO NOT UNDERSTAND ANY PART OF THIS LABELING.

REFER TO THE APPLICATOR'S MANUAL FOR DETAILED PRECAUTIONS, RECOMMENDATIONS AND
DIRECTIONS FOR USE.

WARRANTY

Seller warrants that the product conforms to its chemical description and when used according to label directions under normal conditions of use, it is reasonably fit for the purposes stated on the label. Seller makes no other warranty, either express or implied, and buyer assumes all risk should the product be used contrary to label instructions.

CLASSIFIED BY UNDERWRITERS LABORATORIES, INC., AS TO FIRE HAZARD ONLY WHEN USED SPECIFICALLY AS DIRECTED IN THE MANUFACTURER'S INSTRUCTIONS. DEGESCH 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.
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1. INTRODUCTION

Phostoxin fumigants are used to protect stored commodities from damage by insects and for the control of burrowing pests. Fumigation of stored products with **Phostoxin** in the manner prescribed in the labeling does not contaminate the marketed commodity.

Phostoxin and other DEGESCH metal phosphide fumigants are acted upon by atmospheric moisture to produce hydrogen phosphide (phosphine, PH_3) gas. Phostoxin tablets and pellets contain aluminum phosphide (AlP) as their active ingredient and will liberate hydrogen phosphide via the following chemical reaction:

$$AlP + 3H_2O \text{ ---> } Al(OH)_3 + PH_3$$

Hydrogen phosphide 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 for DEGESCH **Phostoxin** Pellets and Tablets-R.

Phostoxin also contains ammonium carbamate which liberates ammonia and carbon dioxide as follows:

$$NH_2C00NH_4 \text{ ---> } 2NH_3 + CO_2$$

These gases are essentially nonflammable and act as inerting agents to reduce fire hazards. The ammonia gas also serves as a warning agent.

Phostoxin is prepared in two spherical shapes. The rounded tablets weigh approximately 3 grams and release 1 gram of hydrogen phosphide gas. They are about 16mm in diameter and are bulk packaged in resealable aluminum flasks containing 100 or 500 tablets each. The pellets weigh approximately 0.6 gram and release 0.2 gram of hydrogen phosphide gas. They are about 10mm in diameter and are also packaged in resealable flasks containing about 1660 pellets.

Upon exposure to air **Phostoxin** pellets and tablets begin to react with atmospheric moisture to produce small quantities of hydrogen phosphide 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 relative 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 or bulk animal feed. 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 not considered a hazardous waste, partially spent residual from incompletely exposed **Phostoxin** will require special care. Precautions and instructions for further deactivation and disposal will be given later in 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 later in the Applicators Manual.

A summary of safety recommendations is outlined below:

SAFETY RECOMMENDATIONS SUMMARY

1. Carefully read the labeling and follow instructions explicitly.
2. Never fumigate alone from inside the storage structure.
3. Person supervising must be a certified fumigator and personnel assisting must be trained in the use of **Phostoxin**. Never allow uninstructed personnel to handle **Phostoxin**.
4. Approved respiratory protection must be available for the fumigation of structures from within.

5 Wear dry gloves of cotton or other material if contact with **Phostoxin** tablets, pellets or dust is likely. Aerate used gloves and other contaminated clothing in a well ventilated area prior to laundering. Wash hands thoroughly after using **Phostoxin**.

6 Never open fumigant containers in a flammable atmosphere. It is preferable to open them in open air, near a fan or other appropriate ventilation which will rapidly exhaust contaminated air. Containers may be opened inside the structure to be fumigated provided worker's exposure to hydrogen phosphide gas does not exceed allowable limits.

7. Do not allow **Phostoxin** to contact liquid water or to pile up.
8. Dispose of empty containers and spent residual dust in a proper manner consistent with the label instructions.
9. Post warning placards on fumigated areas.
10. Prior to fumigation, notify appropriate company employees. Provide to local officials (fire department, rescue squad, police, etc.) on an annual basis relevant safety information for use in the event of an emergency.
11. Hydrogen phosphide fumigants are **not** to be used for vacuum fumigations.
12. Exposure to hydrogen phosphide must not exceed the eight hour TWA of 0.3 ppm during application, or a ceiling concentration of 0.3 ppm after application is completed.
13. Fumigated areas must be aerated to 0.3 ppm hydrogen phosphide or less prior to reentry by unprotected workers.
14. Finished foods and feeds which have been fumigated with **Phostoxin** must be aerated for 48 hours prior to offering to the end consumer.
15. Transfer of a treated commodity to another site without complete aeration is permissible provided that the new storage site is placarded if its concentration is above 0.3 ppm.
16. Keep containers of **Phostoxin** tightly closed except while removing product for application.
17. Protect materials containing metals such as copper, silver, gold and their alloys and salts from corrosive exposure to hydrogen phosphide.
18. Tablets, pellets and/or their reacted residues must not come into contact with any processed food except that they may be added directly to processed brewer's rice, malt and corn grits used in the manufacture of beer.
19. Do not use aluminum phosphide containers for any purpose otherthan recycling or reconditioning.
20. OSHA recommends preexposure screening of employees to detect impaired pulmonary function. They recommend that any employees developing this condition be referred for medical examination.

2. PRECAUTIONARY STATEMENTS

2.1 Hazards to Humans and Domestic Animals

DANGER: Aluminum phosphide from DEGESCH **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 hydrogen phosphide (phosphine, PH_3) which is an extremely toxic gas. If a garlic odor is detected, refer to the Industrial Hygiene Monitoring section on Page _____ of the Applicator's Manual for appropriate monitoring procedures. Pure hydrogen phosphide gas is odorless; the garlic odor is due to a contaminant. Since the odor of hydrogen phosphide may not be detected under some circumstances, the absence of a garlic odor does not mean that dangerous levels of hydrogen phosphide gas are absent. Observe proper reentry procedures specified elsewhere in the labeling to prevent overexposure.

2.2 Statement of Practical Treatment

Symptoms of overexposure are headache, dizziness, nausea, difficult breathing, vomiting, and diarrhea. In all cases of overexposure get medical attention immediately. Take victim to a doctor or emergency treatment facility.

If the gas or dust from aluminum phosphide is inhaled:

Get exposed person to fresh air. Keep warm and make sure person can breathe freely. If breathing has stopped, give artificial respiration by mouth-to-mouth or other means of resuscitation. Do not give anything by mouth to an unconscious person.

If aluminum phosphide pellets, tablets or powder are swallowed:

Drink or administer one or two glasses of water and induce vomiting by touching back of throat with finger, or if available, syrup of ipecac. Do not give anything by mouth if victim is unconscious or not alert.

If powder or granules of aluminum phosphide get on skin or clothing:
Brush or shake material off clothes and shoes in a well ventilated area. Allow clothes to aerate in a ventilated area prior to laundering. Do not leave contaminated clothing in occupied and/or confined areas such as automobiles, vans, motel rooms, etc. Wash contaminated skin thoroughly with soap and water.

If dust from pellets or tablets gets in eyes:
Flush with plenty of water. Get medical attention.

2.3 Note to Physician (we recommend that this section be given to the attending physician)
Aluminum phosphide tablets, pellets or dust reacts with moisture from the air, acids and many other liquids to release hydrogen phosphide (phosphine, PH_3) gas. Mild exposure by inhalation causes malaise (indefinite feeling of sickness), ringing in the ears, fatigue, nausea and pressure in the chest which is relieved by removal to fresh air. Moderate poisoning causes 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 edema (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 judgement:
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). On progressive edema of the lungs: immediate intubation with a constant removal of edema fluid and oxygen over-pressure respiration, as well as any measures required for shock treatment. 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. Thereafter, apply medicinal charcoal.

2.4 Physical and Chemical Hazards
Aluminum phosphide in tablets, pellets and partially spent dust will release hydrogen phosphide if exposed to moisture from the air or if it comes into contact with water, acids and many other liquids. Since hydrogen phosphide 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 hydrogen phosphide can produce a very energetic reaction. Explosion can occur under these conditions and may cause severe personal injury. **Never allow the buildup of hydrogen phosphide to exceed explosive concentrations.** Do not confine spent or partially spent metal phosphide fumigants as the slow release of hydrogen phosphide from this material may result in formation of an explosive atmosphere. Aluminum phosphide fumigants should not be stacked or piled up or contacted with liquid water. This may cause a temperature increase, increase 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 which will rapidly exhaust contaminated air. When opening, 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 hydrogen phosphide gas. Containers may be opened inside the structure to be fumigated provided worker's exposure to hydrogen phosphide gas does not exceed allowable limits.

Pure phosphine (hydrogen phosphide) 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.

3. DIRECTIONS FOR USE

3.1 General

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

3.1.1 DEGESCH **Phostoxin** tablets and pellets are Restricted Use Pesticides due to the acute inhalation toxicity of hydrogen phosphide (phosphine, PH_3) gas. These products are for retail sale to and use only by certified applicators for those uses covered by the applicator's certification or persons trained in accordance with the Applicator's Manual working under the direct supervision and in the physical presence of the certified applicator. Physical presence means on site or on the premises. Read and follow the label and the DEGESCH America, Inc., Applicator's Manual which contains complete instructions for the safe use of this pesticide.

3.1.2 **Phostoxin** is a highly hazardous material and should be used only by individuals trained in its proper use. Before using, read and follow all label precautions and directions.
Additional copies of this Manual are available from:

DEGESCH America, Inc.
P. O. Box 116
Weyers Cave, VA 24486
(540) 234-9281
Fax: (540) 234-8225
or
Internet address: http://www.degeschamerica.com

Persons working with **Phostoxin** should be knowledgeable of the hazards of this chemical and trained in the use of required respiratory equipment and detector devices, emergency procedures, and use of the fumigant.

3.1.3 At least two persons trained in the use of **Phostoxin** must be present during fumigation of structures if entry into the structure is required for application of the fumigant. Two trained persons must also be present during reentry into fumigated or partially aerated structures. Only one trained person is required to be present when **Phostoxin** is applied from outside the area to be treated.

3.1.4 Shipholds, barges, containers on ships, railroad cars and containers shipped piggyback by rail may be fumigated in transit. However, trucks, vans, trailers and similar transport vehicles cannot be moved over public roads or highways until they are aerated and the warning placards removed.

3.1.5 Do not fumigate commodities with **Phostoxin** when commodity temperature is below 40^oF (5^oC).

3.1.6 The site to be fumigated must first be inspected to determine if it can be made sufficiently gas tight. Then a plan should be developed to provide for safe and efficient application of the fumigant to include emergency procedures, etc., where required, and to decide how monitoring should be conducted to prevent excessive exposures.

3.1.7 Wear dry gloves of cotton or other material while handling **Phostoxin** tablets and pellets. Wash hands thoroughly after use.

3.1.8 Hydrogen phosphide gas may flash at concentrations above its flammable limit. Therefore, never open **Phostoxin** containers in a flammable atmosphere. It is preferable to open them in open air, near a fan or other appropriate ventilation which will rapidly exhaust contaminated air. These precautions will also reduce the applicator's exposure to hydrogen phosphide gas. Containers may be opened inside the structure to be fumigated provided worker's exposure to hydrogen phosphide gas does not exceed allowable limits.

3.1.9 Piling of tablets, pellets, dust from their fragmentation or addition of liquid water to **Phostoxin** may speed up the reaction, cause a temperature increase and confine the gas so that ignition could occur.

3.1.10 As much as is possible, protect unused **Phostoxin** from excessive exposure to atmospheric moisture during application and tightly reseal the aluminum flask prior to returning tablets or pellets to storage.

3.1.11 Hydrogen phosphide gas may react with certain metals and their salts to produce corrosion. This gas is corrosive to copper, copper alloys and precious metals such as silver and gold. Sensitive equipment and items containing these elements should be removed or protected prior to fumigation with **Phostoxin**.

3.1.12 Do not allow **Phostoxin** or its residual dust to come in contact with processed foods or commodity packages intended for retailers except that **Phostoxin** tablets and pellets may be added directly to processed brewer's rice, malt and corn grits used in the manufacture of beer.

3.1.13 Respiratory protection approved for the concentration to which the fumigator will be exposed must be available if **Phostoxin** is to be applied from within the structure to be fumigated. Respiratory protection need not be available for uses such as outdoor application, addition of tablets or pellets to automatic dispensing devices, etc., if exposures above the allowable limits will not be encountered.

A NIOSH/MSHA approved, full-face gas mask - hydrogen phosphide canister combination may be used at levels up to 15 ppm. Above this level or in situations where the hydrogen phosphide concentration is unknown, a NIOSH/MSHA approved, self-contained breathing apparatus (SCBA) or its equivalent must be used.

3.1.14 Notify appropriate company employees prior to fumigation. Provide to local officials (fire department, rescue squad, police, etc.) on an annual basis relevant safety information for use in the event of an emergency.

3.2 **Efficacy Phostoxin** has been found effective against 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 meal worm
dried fruit moth	maize weevil	

Although it is possible to achieve total control of the listed 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 hydrogen phosphide than others. If maximum control is to be attained, extreme care must be taken in sealing, the higher dosages must be used, exposure periods lengthened, proper application procedures followed and temperature and humidity conditions must be favorable.

3.3 **Exposure Conditions**

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

	Minimum Exposure Periods for Phostoxin	
Temperature	**Pellets**	**Tablets**
below 40°F (5°C)	Do not fumigate	Do not fumigate
40°-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 length of the fumigation must be great enough so as to provide for adequate control of the insect pests which 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 in 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 hydrogen phosphide gas production by **Phostoxin** is lower at lower temperatures and humidities.

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 hydrogen phosphide. Careful sealing is required to ensure that adequate gas levels are retained and proper application procedures must be followed to provide satisfactory distribution of hydrogen phosphide gas. 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 storages.

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**, particularly if temperatures and commodity moisture levels or humidity are low during the fumigation.

3.4 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.

3.4.1 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	

3.4.2 Processed Foods

The listed 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 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)
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, wild rice)
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)
Other processed foods

3.4.3 Nonfood Commodities, Including Tobacco

The listed nonfood items may be fumigated with **Phostoxin**. Tobacco and certain other of the nonfood commodities should not be contacted by tablets, pellets or residual dust.

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
Wood, Cut Trees, Wood Chips, Wood and Bamboo Products
Paper and Paper Products
Dried Plants and Flowers
Seeds (grass seed, ornamental herbaceous plant seed and vegetable seed)
Other nonfood commodities

3.5 Recommended Dosages

Hydrogen phosphide 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, the surface of the commodity is sealed off by a tarpaulin. The following dosage ranges are recommended for bulk and space fumigations:

Dosage Guidelines for Fumigations with Phostoxin

Product	per 1000 cu.ft.*	per 1000 bu.*
Pellets	100 - 725	120 - 900
Tablets	20 - 145	25 - 180

*Dosage range for dates, nuts & dried fruits is 100-200 pellets, 20-40 tablets/1000 cu. ft.; 125-250 pellets, 25-50 tablets/1000 bu.

These 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 hydrogen phosphide.

The wide range of dosages listed above is required to handle the variety of fumigation situations encountered in practice. Somewhat higher dosages 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 hydrogen phosphide gas during the fumigation. A good illustration of this point is comparison of the low dosages required to treat modern, well-sealed warehouses with the higher range used for poorly constructed buildings that cannot be sealed adequately. In certain other fumigations, proper distribution of lethal concentrations of gas to reach 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 cannot be uniformly added to the grain and it must be treated by surface application.

Although it is permissible to choose from the full range of dosages listed above, the following dosage ranges are recommended for the various types of fumigations:

Recommended Phostoxin Dosages for Various Types of Fumigations

Type of Fumigation	Dosage Range Pellets	Tablets
1. Space		
mills, warehouses. etc.	100-300/1000 cu. ft.	20-60/1000 cu. ft.
bagged commodities	150-300/1000 cu. ft.	30-60/1000 cu. ft.
processed dried fruits and nuts	100-200/1000 cu. ft.	20-40/1000 cu. ft.
stored tobacco	100-200/1000 cu. ft.	20-40/1000 cu. ft.
2. Bulk Stored Commodities		
vertical storages	150-300/1000 cu. ft.	30-60/1000 cu. ft.
	200-375/1000 bu.	40-75/1000 bu.
tanks	150-350/1000 cu. ft.	30-70/1000 cu. ft.
	200-450/1000 bu.	40-90/1000 bu.
flat storages (loose construction)	250-725/1000 cu. ft.	50-145/1000 cu. ft.
	300-900/1000 bu.	60-180/1000 bu.
farm bins	350-725/1000 cu. ft.	70-145/1000 cu. ft.
	450-900/1000 bu.	90-180/1000 bu.
bunkers & tarped ground storages	150-400/1000 cu. ft.	30-80/1000 cu. ft.
	200-500/1000 bu.	40-100/1000 bu.
railcars	150-325/1000 cu. ft.	30-65/1000 cu. ft.
	200-400/1000 bu.	40-80/1000 bu.
barges	250-725/1000 cu. ft.	50-145/1000 cu. ft.
	300-900/1000 bu.	60-180/1000 bu.
shipholds	150-330/1000 cu. ft.	30-66/1000 cu. ft.
	200-375/1000 bu.	40-75/1000 bu.

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 hydrogen phosphide gas.

3.6 Application Procedures

3.6.1 General Statement

Regardless of the type of storage or structure to be treated, there are several important factors common to all application procedures. A number of these points have been covered in other sections of the Applicator's Manual but are listed again in the following for completeness.

1. A plan should be devised for application, aeration and disposal of the fumigant so as to keep to a minimum any exposures to hydrogen phosphide. See the requirements for Industrial Hygiene Monitoring under the Applicator and Worker Exposure section of this Applicator's Manual.
2. **Phostoxin** tablets or pellets should be applied so as to provide effective gas concentrations throughout the storage. When tablets or pellets are not applied uniformly to a bulk commodity (surface application in a tall silo or ship's hold, for example), exposure times should be lengthened to allow for penetration of gas throughout the storage.
3. The storage structure should be sealed so as to maintain a suitable gas concentration over the time period required for control of insect pests.
4. Ideally, exposure periods should be long enough to provide for adequate control of insect pests and also more or less completely react the fumigant.
5. Piling of large numbers of tablets or pellets, whether applied to a bulk commodity or for space fumigation, may prevent complete breakdown of the product by limiting its access to moist air. This can result in decreased efficacy as a result of poor gas release and may leave an
active residual for disposal which contains considerable amounts of unreacted aluminum phosphide. Piling of product may also result in increased hazard of fire if water should come into contact with the mass of aluminum phosphide.
6. Contact with liquid water should be carefully avoided when applying **Phostoxin** for treatment of bulk commodities or space.
7. Aluminum phosphide fumigants should not be applied to confined spaces where the concentration of hydrogen phosphide may build up to exceed its lower flammable limit.
8. Observe the precautionary and safety statements mentioned elsewhere in this manual.

The following instructions are intended to provide general guidelines for typical fumigations. These instructions are not intended to cover every type of situation nor are they meant to be restrictive. Other procedures may be used if they are safe, effective and consistent with the properties of aluminum phosphide products.

3.6.2 Fumigation of 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 storages which 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 hydrogen phosphide gas.

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.

Phostoxin tablets or pellets 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. Use about 20-50 tablets or 100-250 pellets per probe. Spread the dose uniformly over the surface. Immediately cover the surface of the grain with a plastic tarpaulin. 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. Seal the aeration fan with 4 mil plastic sheeting.

Place fumigation warning signs on entrances to the bin and near the ladder.

Following aeration of the bin, the surface of the grain may be sprayed with an approved protectant to discourage reinfestation.

3.6.3 Fumigation of Flat Storages

1. Establish a plan for application of fumigant to the structure. Treatment of these types of storages may require considerable effort, therefore, sufficient manpower should be available to complete the work rapidly enough to prevent excessive exposure to hydrogen phosphide gas. Vent flasks outside the storage, conduct fumigations during cooler periods and employ other work practices to minimize exposures. It is often advisable to wear respiratory protection during application of fumigant to flat storages. Refer to the sections on Applicator and Worker Exposure and Respiratory Protection.
2. Seal any vents, cracks and other sources of leaks.
3. Apply tablets or pellets by surface application, shallow probing, deep probing or uniform addition as the bin 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 hydrogen phosphide 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.
4. Tarping the surface of the commodity is often advisable, particularly if the overhead of the storage cannot be well sealed.
5. Lock all entrances to the storage and post fumigation warning placards.

3.6.4 Fumigation of Vertical Storages (concrete upright bins and other silos in which grain can be rapidly transferred)

1. Close all openings and seal all 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.
2. Pellets or tablets 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.
3. Seal the bin deck openings after the fumigation has been completed.

4. Bins requiring more than 24 hours to fill should not be fumigated by continuous addition into the commodity stream. These bins must be fumigated by probing, surface application, or other appropriate means. 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.
5. Place warning placards on the discharge gate and on all entrances.

3.6.5 Fumigation of Mills, Food Processing Plants and Warehouses

1. Using the label, calculate the length of the fumigation and 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.
2. Carefully seal and placard the space to be fumigated.
3. 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 to hold **Phostoxin** tablets or pellets.
4. Spread **Phostoxin** on the sheets at a density no greater than 30 tablets per sq. ft. or 75 pellets per sq. ft. This corresponds 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.
5. Doors leading to the fumigated space should be closed, sealed, locked and placarded with warning signs.
6. The fumigation period usually lasts from 2 to 5 days, depending upon the temperature. Upon completion of the exposure period, windows, doors, vents, etc., should be opened and the fumigated structure allowed to aerate for at least two hours before entering. When required, gas concentration readings may be taken using low level detector tubes or similar devices to ensure safety of personnel who reenter the treated area. Refer to the section on Applicator and Worker Exposure.
7. Collect the spent **Phostoxin** dust and dispose of it, with or without further deactivation, following recommendations given under Disposal.
8. Remove fumigation warning placards from the aerated structure.

3.6.6 Fumigation of 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, 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 intransit. See Section 6 of this Applicator's Manual for recommendations on placarding. Notify the consignee if the commodity is to be shipped under fumigation with **Phostoxin**.

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.

Proper handling of treated railcars at their destination is the responsibility of the consignee. The consignee must be familiar with the properties of hydrogen phosphide fumigants, worker exposure limits and symptoms and first aid treatment for hydrogen phosphide poisoning and must know how to make gas concentration measurements. The consignee must:

1. aerate the railcar and verify that it contains no more than 0.3 ppm hydrogen phosphide.
2. remove the fumigation warning placards
3. ensure that worker safety limits have not been exceeded,
4. transfer the fumigated commodity from the railcar, with or without prior aeration and
5. placard the new storage if it contains more than 0.3 ppm hydrogen phosphide.

3.6.7 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 hydrogen phosphide 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.

An enclosure suitable for fumigation may be formed by covering bulk or packaged commodity 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, it 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.
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. **Phostoxin** Prepacs (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. Distribution of hydrogen phosphide 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.
Place warning placards at conspicuous points on the enclosure.

3.6.8 Fumigation of Ships

3.6.8.1 General Information

1. Important - shipboard, in transit 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

2. DEGESCH **Phostoxin** tablets and pellets are classified by EPA as restricted use pesticides due to the acute inhalation toxicity of hydrogen phosphide (phosphine, PH_3) gas. These products are for retail sale to and use only by certified applicators for those uses covered by the applicator's certification or persons trained in accordance with the Applicator's Manual working under the direct supervision and in the physical presence of the certified applicator. Physical presence means on site or on the premises. Read and follow the label and the DEGESCH America, Inc., Applicator's Manual which contains complete instructions for the safe use of this pesticide.

3.6.8.2 Pre-Voyage Fumigation Procedures

1. Prior to fumigating a vessel for in transit cargo fumigation, the master of the vessel, or his representative, and the fumigator must determine whether the vessel is suitably designed and configured so as to allow for safe occupancy by the ship's crew throughout the duration of the fumigation. If it is determined that the design and configuration of the vessel does not allow for safe occupancy by the ship's crew throughout the duration of the fumigation, then the vessel will not be fumigated unless all crew members are removed from the vessel. The crew members will not be allowed to reoccupy the vessel until the vessel has been properly aerated and a determination has been made by the master of the vessel and the fumigator that the vessel is safe for occupancy.

2. The person responsible for the fumigation 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 the vessel with cargo under fumigation. Emergency procedures, cargo ventilation, periodic monitoring and inspections, and first aid measures must be discussed with and understood by the master of the vessel or his representative.

   *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 gas or vapor 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 person in charge of the fumigation shall ensure that a qualified person using gas or vapor detection equipment tests spaces adjacent to spaces containing fumigated cargo and 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 for during the voyage.

3.6.8.3 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.
2. Immediately after application of the fumigant, close and secure all hatch covers, tank tops, butterworth valves, manways, etc.

3.6.8.4.1 Intransit Fumigation of Transport Units (Containers) Aboard Ships

In transit fumigation of transport units on ships is also governed by D.O.T. RSPA 49 CFR 176.76(i) 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 3.6.6.

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

3.6.8.6 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.

3.6.9 Fumigation of Barges

Barge fumigations are 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. Notify consignee if the barge is to be fumigated in transit.

3.6.10 Fumigations in 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 pellet will treat a space of from 1.4 to 10 cubic feet. From 6.9 to 50 cubic feet may be fumigated with a single **Phostoxin** tablet.

3.6.11 Treatment of Beehives, Supers and Other Beekeeping Equipment

Phostoxin tablets and pellets may be used for the control of the greater wax moth in stored beehives, supers and other beekeeping 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 cu. ft.

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.

3.6.12 Burrowing Pest Control

3.6.12.1 List of Burrowing Pests

Phostoxin tablets and pellets may be used out of doors only for the control of the following burrowing rodents and moles: Marmot sp. – Woodchucks and Yellow-Belly Marmots (Rockchucks), Prairie Dogs (except Utah Prairie Dogs), Norway and Roof Rats, Mice, Ground Squirrels, Moles, Voles, Gophers and Chipmunks.

3.6.12.2 Directions for Use

Add from 1 to 4 **Phostoxin** tablets or 5 to 20 pellets to each burrow opening. Then seal tightly by shoveling soil over the entrance after first packing the opening with crumpled newspaper or something similar so as to prevent soil from covering the **Phostoxin** and slowing its action. Subsurface tunnels or runways should be treated every 5 to 10 feet with a dose of 2 to 4 tablets or 10 to 20 pellets. Use lower rates in smaller burrows in tight soils under moist soil conditions and higher rates in larger burrows in porous soils when soil moisture is low. Addition of several cups of water to the burrow prior to dosing with **Phostoxin** may improve efficacy in some porous soils. Treat reopened burrows and fresh runways a second time 1 to 3 days after the initial treatment.

Phostoxin may be used out of doors only for control of burrowing pests. Do not use within 15 feet (5 meters) of inhabited structures. Do not apply to burrows which may open under or into occupied buildings. For use on all agricultural and noncropland areas.

3.6.12.3 Environmental Hazards

This product is very highly toxic to wildlife. 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.

3.6.12.4 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 in the counties listed below, 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

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

FLORIDA

Statewide

GEORGIA

Appling, Atkinson, Bacon, Baker, Ben Hill, Bleckley, Berrien, Brantley, Brooks, Bryan, Bullock, Calhoun, Camden, Candler, 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, Garfield, Iron, Kane, Piute, Sevier, Washington and Wayne

WYOMING
Albany

3.6.12.5 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 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.

4. PROTECTIVE CLOTHING

Wear dry gloves of cotton or other material if contact with **Phostoxin** tablets, pellets or dust is likely. Wash hands thoroughly after handling aluminum phosphide products. Aerate used gloves and other contaminated clothing in a well ventilated area prior to laundering.

5. RESPIRATORY PROTECTION

5.1 When Respiratory Protection Must Be Worn

NIOSH/MSHA approved respiratory protection must be worn if worker exposure limits cannot be met through engineering controls (such as forced air ventilation) and/or appropriate worker practices. Respiratory protection is required if exposure is likely to exceed the eight hour TWA of 0.3 ppm during application, or a 0.3 ppm ceiling at any time afterwards. For example, respiratory protection is required to be worn upon reentry into a partially aerated structure if the hydrogen phosphide concentration is above 0.3 ppm. When required, gas concentration measurements for safety purposes may be made using low level detector tubes. See the section on Applicator and Worker Exposure for monitoring requirements. Information on hydrogen phosphide (phosphine, PH_3) detector tubes may be obtained from DEGESCH America, Inc., or your DEGESCH distributor.

5.2 Permissible Gas Concentration Ranges for Respiratory Protection Devices

A NIOSH/MSHA approved, full-face gas mask - hydrogen phosphide canister combination may be used at levels up to 15 ppm or to escape from levels up to 1500 ppm. Above this level or in situations where the hydrogen phosphide concentration is unknown, a NIOSH/MSHA approved, self-contained breathing apparatus (SCBA) or its equivalent must be used. The NIOSH/OSHA Pocket Guide, 8-85, DHEW/NIOSH 78-210, lists these and other types of approved respirators and the concentration limits at which they may be used.

5.3 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 self-contained breathing apparatus (SCBA) or its equivalent must be available at the site of application in case it is needed. In addition, SCBA or its equivalent must be available locally, for example, at 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 fumigant cannot be made from outside the structure, an approved canister respirator must be worn during application from within the structure being treated.

6. PLACARDING OF FUMIGATED AREAS

The applicator must placard or post all entrances to the structures under fumigation with signs bearing, in English and Spanish:

1. The signal word DANGER/PELIGRO and the SKULL AND CROSSBONES symbol in red.

2. The statement "Area and/or commodity under fumigation, DO NOT ENTER/NO ENTRE".

3. The statement, "This sign may only be removed after the commodity is completely aerated (contains 0.3 ppm or less of hydrogen phosphide gas). If incompletely aerated commodity is transferred to a new site, the new site must also be placarded if it contains more than 0.3 ppm. Workers must not be exposed to more than 0.3 ppm hydrogen phosphide."

4. The date and time fumigation begins and is completed.

5. Name of fumigant used.

6. Name, address and telephone number of the applicator.

All entrances to a fumigated area 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 hydrogen phosphide or less. To determine whether aeration is complete, each fumigated site or vehicle must be monitored and shown to contain 0.3 ppm or less hydrogen phosphide gas in the air space around and, if feasible, in the mass of the commodity. Transfer of incompletely aerated commodity to a new site is permissible. However, the new storage must be placarded if it contains more than 0.3 ppm hydrogen phosphide. No placarding is required if aeration occurs during transfer. Workers who handle incompletely aerated commodity must be informed and appropriate measures taken (i.e., ventilation or respiratory protection) to prevent exposures from exceeding 0.3 ppm hydrogen phosphide.

It is recommended that the persons responsible for removing placards be familiar with the physical, chemical and toxicological properties of hydrogen phosphide. They should also be knowledgeable in making gas concentration measurements, exposure limits and symptoms and first aid treatment for hydrogen phosphide poisoning.

7. AERATION OF FUMIGATED COMMODITIES

7.1 Foods and Feeds

Tolerances for hydrogen phosphide residues have been established at 0.1 ppm for animal feeds and 0.01 ppm for finished foods. To guarantee compliance with these tolerances, it is necessary to aerate these commodities for 48 hours prior to offering them to the end consumer. As an alternative to this aeration period, each container of the treated commodity may be analyzed for residues using accepted analytical methods.

7.2 Tobacco

Tobacco must be aerated for at least three days (72 hours) when fumigated in hogsheads and for at least two days (48 hours) when fumigated in other containers. Tobacco fumigated in containers with plastic liners will probably require longer aeration periods to reach 0.3 ppm.

8. APPLICATOR AND WORKER EXPOSURE

8.1 Hydrogen Phosphide Exposure Limits

Exposure to hydrogen phosphide gas may not exceed 0.3 ppm, measured as an eight hour time-weighted average (TWA), for applicators and workers during application. Application is defined as the time period covering the opening of the first container, applying the appropriate dosage of fumigant and closing up the site to be fumigated. All persons in the treated site and in adjacent indoor areas are covered by this exposure standard.

After application, exposure for any person may not exceed a 0.3 ppm ceiling for hydrogen phosphide. Such exposures may occur if the commodity or space under fumigation leaks, when treated commodity is transferred or handled, if an unaerated or partially aerated space is entered, etc.

8.2 Application of Fumigant

Depending upon temperature and humidity, DEGESCH **Phostoxin** tablets and pellets release hydrogen phosphide 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 exceeds the eight hour TWA of 0.3 ppm, approved respiratory protection must be worn. When required, gas concentration measurements for safety purposes may be made using low level detector tubes. See the writeup below on Industrial Hygiene Monitoring. Information on hydrogen phosphide (phosphine, PH_3) detector tubes may be obtained from DEGESCH America, Inc., or your DEGESCH distributor.

It is often advisable to wear respiratory protection during application of fumigant under hot and humid conditions, particularly when considerable time must be spent inside the structure being treated.

8.3 Leakage from Fumigated Sites

Hydrogen phosphide 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 should be examined to ensure that significant leakage has not occurred. Sealing of the fumigated site and/or air flow in the occupied areas must be sufficient to meet exposure standards.

8.4 Aeration and Reentry

If the area is to be entered after fumigation, it must be aerated until the level of hydrogen phosphide 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 of hydrogen phosphide. Do not allow reentry into treated areas by any person before this time unless protected by an approved respirator.

8.5 Handling Unaerated Commodities

Workers must not be exposed to hydrogen phosphide in excess of 0.3 ppm during moving, storage or processing of incompletely aerated commodities.

8.6 Industrial Hygiene Monitoring

It is recommended that hydrogen phosphide exposures be documented in an operations log or manual for each site and operation where exposures may occur. The purpose of this monitoring is to prevent excessive exposures and to determine when and where respiratory protection is required. This monitoring is mandatory although, once exposures have been adequately characterized, subsequent monitoring is not required. However, spot checks should be made occasionally, especially if conditions change significantly or if an unexpected garlic odor is detected. Gas measurements should be made in the worker's breathing zone. Monitoring is not required for outdoor operations.

If monitoring shows that workers are exposed to concentrations in excess of the permitted limits, then engineering controls (such as forced air ventilation) and/or appropriate work practices should be used, where possible, to reduce exposure to within permitted limits.

There are a number of devices on the market for the measurement of hydrogen phosphide gas levels for industrial hygiene purposes. One of these is the hydrogen phosphide detector tube used in conjunction with the appropriate hand-operated air sampling pump. These devices are reliable, portable, simple to use, do not require extensive training and are relatively rapid, inexpensive and accurate. Low level detector tubes are available which can detect 0.1 ppm and are suitable for industrial hygiene monitoring.

9. STORAGE INSTRUCTIONS

1. Store **Phostoxin** in a dry, well ventilated area away from heat, under lock and key. Post as a pesticide storage area. Do not contaminate water, food or feed by storing pesticides in the same areas used to store these commodities.
2. Do not store in buildings where humans or domestic animals reside. Keep out of reach of children.
3. DEGESCH **Phostoxin** tablets and pellets are supplied in gas-tight, resealable aluminum flasks. Do not expose the product to atmospheric moisture any longer than is necessary and seal tightly before returning opened flasks to storage.
4. The shelf life of **Phostoxin** is virtually unlimited as long as the containers are tightly sealed.

10. DISPOSAL INSTRUCTIONS

10.1 General

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

10.1.2 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 label 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 11 of this manual, Spill and Leak Procedures.

10.1.3 Some local and state waste disposal regulations may vary from the following 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.

10.1.4 Triple rinse flasks and stoppers with water. Then offer forrecycling or reconditioning, or puncture and dispose of in a sanitarylandfill, 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. Or, it is permissible to remove lids and expose empty flasks to atmospheric conditions until residue in the flasks is reacted. Then puncture and dispose of in a sanitary landfill or other approved site, or by other procedures approved by state and local authorities.

10.1.5 If properly exposed, the residual dust remaining after a 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," will require special care.

10.2 Directions for Disposal of Residual Dust from Phostoxin

10.2.1 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 hydrogen phosphide may be given off from unreacted aluminum phosphide, and confinement of the gas may result in a flash.

10.2.2 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.

10.2.3 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.

10.2.4 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.

10.3 Directions for Deactivation of Partially Spent Residual Dust from Phostoxin

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

10.3.2 Residual dust from Phostoxin may be deactivated as follows using the "Wet Method."

10.3.2.1 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 of detergent is suggested. The container should be filled with deactivating solution to within a few inches of the top.

10.3.2.2 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.

10.3.2.3 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.

10.3.2.4 **Caution**: Wear appropriate respiratory protection 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.

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

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

10.3.3.2 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.

11. SPILL AND LEAK PROCEDURES

11.1 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 hydrogen phosphide 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 hydrogen phosphide gas which 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 11.2. 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.

11.2 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:

11.2.1 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 is suggested. The container should be filled with deactivating solution to within a few inches of the top.

11.2.2 The tablets or pellets are 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 15 gallons of water-detergent solution for each case of material. Wear appropriate respiratory protection during wet deactivation.

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

11.2.4 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.

11.2.5 **Caution:** Wear appropriate respiratory protection during wet deactivation of unexposed or incompletely exposed Phostoxin. Never place pellets, tablets, or dust in a closed container such as a dumpster, sealed drum, plastic bag, etc., as flammable concentrations and a flash of hydrogen phosphide gas are likely to develop.

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

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