

APPLICATOR'S MANUAL
FOR
Detia® Fumex Bags

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 THIS PRODUCT. CONSULT WITH YOUR STATE LEAD PESTICIDE REGULATORY AGENCY TO DETERMINE REGULATORY STATUS, REQUIREMENTS AND RESTRICTIONS FOR FUMIGATION USE IN THAT STATE. CALL (540) 234-9281/1-800-330-2525 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's Manual for requirements of the physical presence of a Certified Applicator.

FOR USE AGAINST INSECTS WHICH INFEST STORED COMMODITIES

Active Ingredient: Aluminum Phosphide	57.0%
Inert Ingredients:.....	43.0%
Total	100.0%



**KEEP OUT OF REACH OF CHILDREN
DANGER - POISON - PELIGRO**



PRECAUCION AL USUARIO: Si usted no lee ingles, no use este producto 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.)

Manufactured for:

**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
E-mail: degesch@degeschamerica.com
EPA Est. No.: 33982-WG-01
EPA Reg. No. 72959-10**

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 risks 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 LABELING. DETIA[®] FUMEX IS NON-COMBUSTIBLE ITSELF BUT, EXPOSURE TO MOIST AIR OR WATER RELEASES FLAMMABLE AND TOXIC PHOSPHINE GAS. SPONTANEOUS IGNITION MAY RESULT IF CONTACTED BY WATER, ACIDS OR CHEMICALS (88X5).

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1. **FIRST AID**

Symptoms of exposure to this product 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 inhaled:

- Move person to fresh air.
- If person is not breathing, call 911 or an ambulance; give artificial respiration, preferably by mouth-to-mouth, if possible.
- Keep warm and make sure person can breathe freely.
- Call a poison control center or doctor for further treatment advice.

If swallowed:

- Call a poison control center or doctor immediately for treatment advice.
- Have person drink one or two glasses of water and induce vomiting by touching back of throat with finger, or if available, administer syrup of ipecac.
- Do not give anything by mouth to an unconscious person.

If 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 in eyes:

- Hold eye open and rinse slowly and gently with water for 15-20 minutes.
- Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.
- Call a poison control center or doctor for treatment advice.

HOT LINE NUMBER

Have the product container label or Applicator's Manual with you when calling a poison control center, doctor, or when going for treatment. **CONTACT 1-800-308-4856 FOR ASSISTANCE WITH HUMAN OR ANIMAL MEDICAL EMERGENCIES.** You may also contact Degesch America, Inc. – 540-234-9281/1-800-330-2525 or CHEMTREC – 1-800-424-9300 for all other chemical emergencies.

2. **NOTE TO PHYSICIAN**

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 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 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 lung, 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.

3. INTRODUCTION

DETIA® FUMEX bagged fumigants are used to protect stored commodities from damage by insects. Fumigation of stored products with **DETIA® FUMEX** in the manner prescribed in the labeling does not contaminate the marketed commodity.

DETIA® FUMEX and other DEGESCH metal phosphide fumigants are acted upon by atmospheric moisture to produce phosphine gas.

DETIA® FUMEX contains aluminum phosphide (AIP) as its active ingredient and, once the sealed container is opened, the product will liberate phosphine via the following chemical reaction:



Phosphine gas is highly toxic to insects, 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.

DETIA® FUMEX is available in two forms. A 34g bag made of a tough, porous Tyvek polymer. The bag will liberate 11g of phosphine. **FUMEX** is also available in bag-blankets for the fumigation of larger structures. The bag-blanket contains 100 serially-connected bags, each bag blanket liberating 1100g of phosphine.

The **DETIA® FUMEX** bag is packed in non-resealable aluminum-foil pouches which are, in turn, packed in resealable metal drums. One size drum contains a total of 450 bags, 6-34g bags, each packed in 75 aluminum foil pouches. A second sized drum contains a total of 500 bags packed in 50 aluminum foil pouches of 10 bags each. The bag-blanket is packed in resealable drums containing 6 blankets, each individually packed in non-resealable aluminum foil pouches. Drums used for packaging **DETIA® FUMEX** conform to UN Performance Oriented Standards.

Upon exposure to air, **DETIA® FUMEX** bags 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. **DETIA® FUMEX** bags react somewhat faster than do the pellets and tablets. The rates of decomposition will vary depending upon moisture and temperature conditions. For example, when moisture and temperature of the fumigated commodity are high, decomposition of **DETIA® FUMEX** may be complete in less than 3 days. However, at lower ambient temperatures and humidity levels, decomposition of **DETIA® FUMEX** may require 5 days or more. The spent bag must be retrieved for disposal after fumigations. If properly exposed, the spent **DETIA® FUMEX** bag will normally contain only a small amount of unreacted aluminum phosphide and may be disposed of without hazard. While **DETIA® FUMEX** is not considered a hazardous waste, partially spent residual dust from incompletely exposed **DETIA® FUMEX** will require special care. Precautions and instructions for further deactivation and disposal are given in Section 24 of this Manual.

4. PRECAUTIONARY STATEMENTS

4.1 Hazards to Humans and Domestic Animals

DANGER: Aluminum phosphide from **DETIA® FUMEX** bags may be fatal if swallowed. Do not get the dust 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 elsewhere in 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 absent. Observe proper re-entry procedures specified in Section 15.4 of the labeling to prevent overexposure.

4.2 Physical and Chemical Hazards

DETIA® FUMEX bags will release phosphine if exposed to moisture from the air or if it comes into contact with water, acids and many other liquids. Since phos-

phine 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 metal phosphide fumigants as the slow release of phosphine 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 that will rapidly exhaust contaminated air. When opening, point the container away from the face and body and slowly loosen the lid. 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 humidity. 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.

Phosphine 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 metal phosphide products to the structure, turn off any lights and unessential electric equipment.

DETIA® FUMEX bags are Restricted Use Pesticides due to the 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.
153 TRIANGLE DRIVE
P. O. BOX 116
WEYERS CAVE, VA 24486 USA
Telephone: (540)234-9281/1-800-330-2525
Fax: (540)234-8225
Internet: www.degeschamerica.com

DIRECTIONS FOR USE

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

5. PESTS CONTROLLED

DETIA® FUMEX bags have 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	pea weevil
bean weevil	fruit flies	pink bollworm
bees	granary weevil	raisin moth
cadelle	greater wax moth	red flour beetle
cereal leaf beetle	hairy fungus beetle	rice weevil
cigarette beetle	Hessian fly	rusty grain beetle
confused flour beetle	Indian meal moth	saw-toothed grain beetle
dermestid beetle	Khapra beetle	spider beetle
dried fruit beetle	lesser grain borer	tobacco moth
dried fruit moth	maize weevil	yellow mealworm

Although it is possible to achieve total control of the 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 DETIA® FUMEX

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

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

DETIA® FUMEX bags may be added directly to the surface of animal feed, feed ingredients and raw agricultural commodities stored in bulk. For these commodities not stored in bulk, **DETIA® FUMEX** may be placed on trays, etc., and fumigated as with processed foods. Note that the bags must be retrieved for disposal prior to further processing or packaging of the treated commodity.

Raw Agricultural Commodities and Animal Feed and Feed Ingredients Which May Be Fumigated with DETIA® FUMEX

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 **DETIA® FUMEX**. Under no condition shall any processed food or bagged commodity come in contact with active or residual dust from **DETIA® FUMEX** bags. We recommend tablets or pellets be used for direct addition to raw and other commodities for which this is approved.

Processed Foods Which May Be Fumigated With DETIA® FUMEX

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, non-dairy creamers and non-fat 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 Non-Food Commodities Including Tobacco

The listed non-food items that may be fumigated with **DETIA® FUMEX** bags. Residual dust should not contact tobacco and certain other of the non-food commodities.

Non-Food Commodities Which May Be Fumigated With DETIA® FUMEX

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 non-food 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 DETIA® FUMEX Bags</u>
40° F (5° C)	Do not fumigate
40° -53° F (5-12° C)	14 days (336 hours)
54° -59° F (12-15° C)	9 days (216 hours)
60° -68° F (16-20° C)	5 days (120 hours)
above 68° F (20° C)	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 **DETIA® FUMEX** 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 **DETIA® FUMEX** 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 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 **DETIA® FUMEX** is recommended if phosphine concentrations drop below an effective level. If re-entry into the treated structure is required, follow the requirements for manpower and respiratory protection usage found elsewhere 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. 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 **DETIA® FUMEX**.

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.

8. DOSAGE RATE GUIDELINES

Allowable and Recommended Dosage 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 **DETIA® FUMEX** 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.

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 phosphine 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.

8.1 Maximum Allowable Dosage Guidelines for Fumigation with DETIA® FUMEX Bags

13 DETIA® FUMEX Bags per 1000 cu. ft.

(The maximum dosage allowed for dates and nuts is 4 bags per 1000 cu. ft.)

8.2 Recommended DETIA® FUMEX Dosages for Various Types of Fumigation

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.

<u>Type of Storage</u>	<u>Recommended Dosage Per 1000 Cu.Ft.</u>
1. Space (including packaged commodities)	
a. Mills, Warehouses, etc.	2-6 Bags
b. Bagged Commodities	3-6 Bags
c. Dried Fruits, Nuts & Dates	2-4 Bags
d. Stored Tobacco	2-4 Bags
2. Bulk Stored Commodities	
a. Vertical Storage	3-6 Bags
b. Tanks	4-6 Bags
c. Flat Storage (loose construction)	5-13 Bags
d. Farm Bins	6-13 Bags
e. Railcars	3-6 Bags
f. Bunkers, Tarped and Ground Storage	3-6 Bags
g. Barges	3-7 Bags
h. Shipholds	3-6 Bags

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:

Gloves are not required to handle intact bags or bag blankets. However, wear dry gloves of cotton or other material if contact with the active or spent material from the bags 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 Short-Term Exposure Level (STEL) 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, list these and other types of approved respirators and the concentration limits at which they may be used.

10.3 Requirements For Availability of Respiratory Protection

If **DETIA® FUMEX** 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.

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 **DETIA® FUMEX** 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 IN-TRANSIT VEHICLES UNDER FUMIGATION

The trained person(s) must be trained by a Certified Applicator following the EPA accepted product Applicator's Manual that must precede or be attached to the out-

side 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 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 a 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 can report the incident as per requirements of 40 CFR Part 159.

14.3 Theft of Products:

Immediately report to the local police department theft 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) 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, **DETIA® FUMEX** releases 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 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 Re-Entry

If the structure area is to be entered after fumigation, it must be aerated until the level of phosphine gas is 0.3 ppm or below. The area 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 re-entry into treated structures by any person before the level of phosphine reaches 0.3 ppm or below, unless protected by an approved respirator.

15.5 Handling Un aerated Commodities

Transfer of a treated commodity via bulk handling equipment such as augers, drag conveyors and conveyor belts to a new 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 must be placarded if it contains more than 0.3 ppm 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 site 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 word 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 structure and/or commodity is completely aerated (contains 0.3 ppm or less of phosphine gas). If incompletely aerated commodity is transferred to a new structure, the new storage 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 to 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 STRUCTURES

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 area and will decrease the chance of unwanted exposures outside of the fumigated structure.

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, 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 and for at least two days (48 hours) when fumigated in other containers

or until the concentration is below 0.3 ppm. When plastic liners are used, longer aeration periods will probably be required to aerate the commodity down to 0.3 ppm.

19. **STORAGE INSTRUCTIONS**

DETIA® FUMEX bags 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 should include, but are not limited to: company policy, insurance carrier, Occupational Safety and Health Administration (OSHA), Right-to-Know and Emergency Planning and Community Right-to-Know and local 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:

<u>Category</u>	<u>Degree of Hazard</u>
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-E11329

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
P. O. Box 116
Weyers Cave, VA 24486
Telephone: (540)234-9281/1-800-330-2525
Internet: 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 and follow 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, Applicator's 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/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.

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's 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, yet allowing for flexibility, 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 state and local laws. The success or failure 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 check-

list 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 site.

A. PRELIMINARY PLANNING AND PREPARATION

1. Determine the purpose of the fumigation.
 - a. Elimination of insect infestation
 - b. Plant pest quarantine
2. Determine the type of fumigation, for example:
 - a. Space: tarp, mill, warehouse, food plant, outdoor area
 - b. Vehicle: railcar, truck, van, container
 - c. Commodity: raw agricultural or processed foods, non-food.
 - d. Type of Storage: vertical silo, farm storage, flat storage
 - e. Vessels: ship or barge. In addition to the Applicator's Manual, read the U.S. Coast Guard Regulations 46CFR 147A.
3. Fully acquaint yourself with the structure and/or area 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 structure characteristics. Prepare with the owner/operator/person in charge. Draw or have 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 (i.e., 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 and 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 fumigation application locations if the job involves entry into the structure for fumigation.
 - k. Review labeling and Applicator's Manual.
 - l. Exposure time considerations:
 1. Fumigant 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 one 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 an emergency.

C. MONITORING

1. Safety
 - a. Monitoring 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 log records document there is no phosphine present above the safe levels, 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 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 levels have fallen below

the targeted level, the fumigators, following proper entry procedures, may re-enter the structure and add additional product.

- b. All phosphine readings should be documented.

D. NOTIFICATION

1. Confirm all 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’s 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 site.

F. APPLICATION PROCEDURES & FUMIGATION PERIOD

1. Plan carefully and apply all fumigants in accordance with the label requirements.
2. When entering into the structure 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 of the structure where appropriate.
4. Provide watchmen when entry into the fumigated structure by unauthorized persons cannot otherwise be assured.
5. When entering structures, always follow OSHA rules for confined spaces.
6. Document that the receiver of railcars fumigated in-transit has been notified.
7. Turn off any electric lights in the fumigated structure as well as all non-essential electrical motors.

G. POST-APPLICATION OPERATIONS

1. Provide watchmen when you cannot secure the fumigation structure from entry by unauthorized persons during the aeration process.
2. Aerate in accordance with structural limitations.
3. Turn on ventilating or aerating fans where appropriate.
4. Use a suitable gas detector before re-entry into a 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 vehicle into 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 re-enter the aerated structure.

22. APPLICATION PROCEDURES

A FMP must be devised for application, aeration and disposal of the fumigant so as to keep to a minimum any exposures to phosphine and to help assure adequate control of the insect pests. The following instructions are intended to provide general guidelines for typical fumigations.

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:
 - (a) 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.
 - (b) 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 (a) and (b) 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 **DETIA® FUMEX** has been applied. Tarping the grain surface will greatly reduce the leak rate of the gas as well as reduce the amount of **DETIA® FUMEX** 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. **DETIA® FUMEX** bags or bag blankets may be scattered over the surface or “stepped” into or buried in the grain several inches below the surface so that the tarp is not directly contacting the fumigant. Mark the location of the bags or bag blankets so that they may be easily retrieved.
7. Immediately cover the surface of the grain with a plastic tarpaulin.
8. If the storage is equipped with an aeration fan, seal the aeration duct. Do not apply **FUMEX** bags or bag blankets to aeration ducts.
9. Place fumigation warning signs on entrances to the bin and near the ladder.
10. 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 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 label, determine the length of the fumigation and calculate the dosage (number of bags) to be applied based upon volume of the building, air and/or commodity temperature and the general tightness of the structure.
6. Apply bags or bag blankets on or just below the surface of the commodity. Do not apply **FUMEX** to aeration ducts. Do **not** add any metal phosphide fumigants to duct work if there is water present or any likelihood of water leaking into the duct.

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.
9. Bins need not be aerated unless re-entry into the storage is required.
10. Remove and dispose of bags and/or blankets prior to emptying bin or during emptying if the bags cannot be retrieved otherwise.

22.3 Vertical Storages (concrete upright bins and other silos in which grain can be rapidly transferred). **DETIA® FUMEX** bags and bag blankets may only be added to the surface of the commodity and must be removed as the bin is emptied.

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 and any openings which connect to adjacent bins.
5. Using the label, determine the length of the fumigation and calculate the dosage of **FUMEX** to be applied, based upon volume of the building, air and/or commodity temperature and the general tightness of the structure.
6. Bags and bag blankets may be applied only to, or just below, the surface of the commodity. All spent bags and blankets must be removed when the bin is emptied after the fumigation.
7. Keep an accurate count of bags and blankets added since they must be removed prior to emptying the bin. Bags can be removed by transfer of the commodity through a screen or scale operator.
8. Seal the bin deck openings after the fumigation has been completed.
9. An air recirculation system should be used or exposure periods lengthened to allow for diffusion of gas to all parts of the bin if the fumigant has not been applied uniformly throughout the commodity mass.
10. 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 to concentrations above the permitted exposure levels.
3. Develop an appropriate Fumigation Management Plan. (Refer to FMP guidelines.)
4. Using the label, determine the length of the fumigation and calculate the dosage of **DETIA® FUMEX** 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 under 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. **DETIA® FUMEX** bags and bag blankets may be placed on the floor or other surfaces or atop commodity packages containing processed food. If bags cannot be placed on the floor or attached to walls or other support, the bags may be taped to a cardboard disc and disc attached to the packaged commodity.
8. Turn off all 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 signs.
9. 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 determined to be below the allowable limits. Gas concentration readings may be taken using low-level detector tubes or similar devices to ensure safety of personnel who re-enter the treated area.
10. Collect the spent **DETIA® FUMEX** and dispose of it, with or without further deactivation. Refer to Disposal Instructions in this manual.
11. Remove fumigation warning placards from the aerated structure.

22.5 Railcars, Containers, Trucks, Vans and other Transport Vehicles

22.5.1 General

Railcars and containers, trucks, vans and other transport vehicles shipped piggyback by rail may be fumigated intransit. However, the

aeration of railcars, containers and other transport vehicles is prohibited enroute. It is not legal to move truck trailers, containers, vans, etc., over public roads or highways until they have been aerated.

Carefully seal any vents, cracks or other leaks, particularly if the fumigation is to be carried out in-transit.

DEGESCH FUMI-KAP AND FUMI-BONNET are recommended for the application of **DETIA® FUMEX** bags in railroad hopper cars.

- Clear hatch area of any debris which may prevent application of the Fumi-Kap.
- Determine the proper size of Fumi-Kap required for hatch.
- Ensure that the commodity is at least one-foot below the Fumi-Kap by digging out the commodity, if necessary.
- Stretch Fumi-Kap (Remay portion) over the hatch opening.
- Tape the appropriate number of **Detia® Fumex** Bags to the Fumi-Kap. Take care to tape only along package edges. **Do not tape directly across bag.**
- Allow Fumi-Kap to sag into the hatch opening to provide head space between fumigant and Fumi-Bonnet.
- Stretch Fumi-Bonnet (poly) over the Fumi-Kap. **Do not allow the Fumi-Bonnet to contact the packaged fumigant.** Alternatively, the bonnet may be applied directly to the bottom of the hatch cover lid.
- Close and secure hatch cover/lid.
- Apply fumigation warning signs as directed in Section 16 of this Applicator's Manual.

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 in-transit. 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 working under the supervision of a certified applicator must supervise the aeration process and removal of the placards.

22.5.2 Procedures for Processed Foods

The active or spent dust from **DETIA® FUMEX** bags must not come into contact with processed foods.

Bulk Railcars:

1. Close and secure all hatch covers except those being utilized for the fumigation.

2. Seal all other openings. Pay particular attention to vents.
3. Clean the flange lip of hatch (or hatches) being utilized. If the commodity extends into the throat of the hatch, force it away as far as possible.
4. Open bag containers and tape bags to a cardboard disc. Be sure to tape across the bag ends only. Do **not** cover the porous surface of the bags.
5. Place the disc into position, bag side up and secure with masking tape.
6. Lower the cover into place and secure. Tape fumigation warning placards securely to the hatch covers which have been treated.

Procedures for Boxcars:

1. Close and secure one of the doors from the inside. Seal all openings and joints. If possible, caulk joints and drape entire doorway with polyethylene film, securing the edges to the inner wall, floor and ceiling with masking tape.
2. Inspect the roof, floor and walls for holes and/or cracks. Seal all openings.
3. If possible, drape remaining doorway with polyethylene film before door is closed. Secure edges to door jams and floor. Close door and secure. If doorway is draped with polyethylene it may not be necessary to seal the door from the outside. If door is not draped, seal all cracks, openings and joints from the outside.
4. Open containers of bags and tape bags to cardboard discs. Be sure to tape across the bag ends only.
5. Place the loaded discs inside the boxcar and secure, bag side up, with tape or nail to the wall.
6. Post fumigation "warning" placards on each door.

Procedures for Containers:

1. Procedures for trucks, vans and other transport containers are essentially the same for boxcars, except their doors tend to be more gas tight and they often have only a rear door. The rear door must be sealed after application of **DETIA® FUMEX** is completed.

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 poly covered 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 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 Fumigant Management Plan. (Refer to FMP guidelines.)
4. Using the label, determine the length of the fumigation and calculate the dosage of **DETIA® FUMEX** bags to be applied based upon volume of space under the tarp, air and/or commodity temperature.
5. Bags may be applied to the tarped stack or bunker storage of bulk commodity through slits in the poly covering. Avoid application of large amounts of **DETIA® FUMEX** at any one point. **DETIA® FUMEX** should be added just below the surface of the commodity to avoid contact with condensation and other sources of water which occur beneath the poly. Slits in the covering should be carefully taped to prevent loss of gas once the dose has been applied. Care should be taken to see that poly is not allowed to cover the **DETIA® FUMEX** and prevent contact with moist air or confine the liberated 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 Shiphold

22.7.1 General Information

1. Important – 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

22.7.2 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 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 that the design and configuration of the vessel does not allow for safe occupancy by the ship's crew throughout the duration of the fumigation, then the vessel must not be fumigated unless all crew members are removed from the vessel. The crew members are not allowed to reoccupy the vessel until it has been properly aerated and the master of the vessel and the fumigator have made a determination that the vessel is safe for occupancy.
2. The certified applicator 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 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 test spaces adjacent to areas containing fumigated cargo as well as all regu-

larly occupied spaces for fumigant leakage. If leakage of the fumigant is detected, the Certified Applicator 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 of a ship hold in-transit fumigation.

22.7.3 Application Procedures for Bulk Dry Cargo Vessels and Tankers

1. After a hold has been filled, open the **FUMEX** containers and distribute bags or bag blankets uniformly onto commodity surface with spacing between each. Do not place **FUMEX** within 10 feet of the side walls. Cover the blankets with a few inches of grain leaving the ends exposed for easy retrieval at the end of the fumigation.
2. Immediately after application of the fumigant, close all hatch covers, tank tops, butterworth valves, manways, etc. Stop the closing if the cover snags an individual bag or bag blankets. Reposition the **FUMEX** and resume closing.

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(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 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. 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 **DETIA® FUMEX** 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. **DISPOSAL INSTRUCTIONS**

24.1 **General**

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

Unreacted or partially reacted **DETIA® FUMEX** 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 25 of this manual.

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.

24.2 **Container Disposal**

Triple rinse cans, drums or foil pouches with water if they have been contacted with spent or partially reacted dust from **FUMEX**. 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 expose empty containers to atmospheric conditions until any residue 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.

24.3 Residual Dust

If properly exposed, the residual dust remaining after a fumigation with **DETIA® FUMEX** will be a grayish-white powder. This will be a non-hazardous waste and contain only a small amount of unreacted aluminum phosphide. However, residual dust from incompletely exposed **DETIA® FUMEX** (so-called green dust) requires special care. Do not confine spent or partially spent bags in a closed container as this may result in a fire hazard. Small amounts of phosphine may be given off from the unreacted aluminum phosphide and confinement of the gas may result in a flash. Active residual material must be deactivated prior to disposal.

24.4 Disposal of Unreacted or Partially Reacted DETIA® FUMEX bags: (From spills, leaking containers or other sources)

Unreacted or partially reacted **DETIA® FUMEX** bags are acutely hazardous. Improper disposal of this product is a violation of federal law. If this product cannot be disposed of by ordinary use or according to the instructions that follow, contact your state pesticide or environmental control agency or the hazardous waste representative at the nearest EPA regional office for guidance. Do not contaminate water by disposal. 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.

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 **DETIA® FUMEX** dust from bags in a toilet.

25. SPILL AND LEAK PROCEDURES

25.1 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 **DETIA® FUMEX**. Water in contact with unreacted bags 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. Gloves are **not** required to handle intact bags or bag blankets.

Return all intact containers and bags and blankets when pouches are intact to fiberboard cases or other packaging which has been suitably constructed and marked according to DOT regulations. Notify consignee and shipper of damaged drums.

If pouches have been punctured or damaged so as to leak, the pouch may be temporarily repaired with aluminum tape. 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. 540-234-9281/1-800-330-2525**.

If a spill has occurred which is only a few minutes old, collect the bags and place them back into the original container if they are intact and close tightly. Place the collected bags in a sound metal container if the original containers are damaged. **Caution:** These containers may flash upon opening at some later time if the pouches have been damaged.

If the age of the spill is unknown or if the bags 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 to transport to a secure site for deactivation. Alternatively, small amounts of spillage may be spread out in an open area away from inhabited buildings to be deactivated by atmospheric moisture.

26. DEACTIVATION PROCEDURES

The methods below may be used for deactivating used or unused **DETIA® FUMEX** bags regardless of the extent to which the aluminum phosphide has decomposed.

26.1 Dry Deactivation

Collect bags and blankets and place them into a well-ventilated holding container such as wire cage or other similar devices. Store the bags in one of these devices until the bags are spent. Unused or partially spent bags may be spread out on the ground in a secure open area away from occupied buildings to be deactivated by atmospheric moisture. Care should be taken so that they are not carried away by the wind. Dry deactivation is the recommended procedure for unused or partially spent bags. If in doubt as to whether the bags are spent, contact DEGESCH America, Inc.

Ignition may occur if large numbers of incompletely reacted bags are contacted by liquid water. This can occur in open or perforated storage containers. Therefore, such storage should be out-of-doors in a relative isolated area protected from rain.

26.2 Wet Deactivation – Method One:

Fill an appropriate sized container with water a few inches from the top. Remove the bag or bag blankets from its damaged pouch. Puncture each bag and submerge **FUMEX** for 36 hours. A metal grid works well to keep bags submerged. **Caution: FUMEX** may ignite if it is allowed to float to the surface. Do not cover the container. Wear respiratory protection equipment if worker exposure levels are likely to be exceeded. Wear a NIOSH/MSHA approved full-face gas mask – phosphine canister combination if exposed to levels up to 15 ppm or a Self-Contained Breathing Apparatus (SCBA) if exposure is unknown or

above 25 ppm. This should be done outdoors. The water may be disposed of in a storm sewer or by pouring it out on the ground.

26.3 Wet Deactivation – Method Two

Fill an appropriate sized metal container 2/3 full with water. For each gallon of water add ¼ cup of low sudsing detergent or surfactant. Use no less than 1 gallon of water/detergent solution for 60 **DETIA® FUMEX** bags. Cut open each bag and dump contents into the container as the water is stirred. If worker protection standards will be exceeded, 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. **DO NOT COVER THE CONTAINER AT ANY TIME.** This should be done outdoors.

27. DISPOSAL PROCEDURES

In open areas small amounts (up to 7.0 kg) of the spent bags may be disposed of on-site by burial of the bags or by opening the bags and spreading the dust over the land surface away from inhabited buildings.

Spent bags may also be collected and disposed of at a sanitary landfill, approved pesticide incinerator or other approved sites or by other procedures approved by federal, state and local authorities.

Do not dispose of dust in a toilet.

Dispose of water/dust slurry with or without preliminary pouring out of excess water in a sanitary landfill or other suitable burial site approved by local authorities. Where permissible, the slurry may be poured out on the ground. If it is held 36 hours, 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 unexposed or incompletely exposed **DETIA® FUMEX**. **Never place bags or their 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.**

FOR ASSISTANCE CONTACT:

DEGESCH AMERICA, INC.
153 Triangle Drive
P. O. Box 116
Weyers Cave, VA 24486 USA
Telephone: (540)234-9281/1-800-330-2525
Fax: (540)234-8225
Internet: www.degeschamerica.com

or

For Human or Animal Medical Emergencies: PROSAR: 1-800-308-4856
For All Other Chemical Emergencies: CHEMTREC: 1-800-424-9300