



**APPLICATOR'S MANUAL
FOR**



FOR USE ONLY WITH THE DEGESCH PHOSPHINE GENERATOR
TO CONTROL PESTS IN STORED GRAIN, PROCESSED FOODS,
FEEDS AND NON-FOOD COMMODITIES,
INCLUDING TOBACCO

RESTRICTED



KEEP OUT OF REACH OF CHILDREN

GUARANTEE: Magnesium Phosphide.....93%

**READ THE ENTIRE LABEL & THIS APPLICATOR'S
MANUAL BEFORE USING**

REGISTRATION NO. 26523

PEST CONTROL PRODUCTS ACT

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THIS PRODUCT IS ACCOMPANIED BY AN APPROVED LABEL AND APPLICATOR'S MANUAL. READ AND UNDERSTAND THE ENTIRE LABEL AND MANUAL. ALL PARTS OF THE LABEL AND MANUAL ARE EQUALLY IMPORTANT FOR SAFE AND EFFECTIVE USE OF THIS PRODUCT. CALL THE MANUFACTURER IF YOU HAVE ANY QUESTIONS OR DO NOT UNDERSTAND ANY PART OF THIS LABEL AND MANUAL. REFER TO THIS APPLICATOR'S MANUAL FOR DETAILED PRECAUTIONS, RECOMMENDATIONS AND DIRECTIONS FOR USE.

MAGNESIUM PHOSPHIDE GRANULES 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 OTHER LIQUIDS.

HYDROGEN PHOSPHIDE-AIR MIXTURES AT CONCENTRATIONS ABOVE THE LOWER FLAMMABLE LIMIT MAY IGNITE SPONTANEOUSLY. IGNITION OF HIGH CONCENTRATIONS OF HYDROGEN PHOSPHIDE CAN PRODUCE A VERY ENERGETIC REACTION. EXPLOSIONS CAN OCCUR UNDER THESE CONDITIONS AND MAY CAUSE SEVERE PERSONAL INJURY. **NEVER ALLOW THE BUILD-UP OF HYDROGEN PHOSPHIDE TO EXCEED EXPLOSIVE CONDITIONS.** DO NOT CONFINE SPENT OR PARTIALLY SPENT DUST FROM METAL PHOSPHIDE FUMIGANTS, AS THE SLOW RELEASE OF HYDROGEN PHOSPHIDE FROM THE MATERIAL MAY RESULT IN THE FORMATION OF AN EXPLOSIVE ATMOSPHERE.

NOTICE TO USER: This pest control product is to be used only in accordance with the directions on this label. It is an offence under the *Pest Control Products Act* to use this product in a way that is inconsistent with the directions on the label. The user assumes the risk to persons or property that arises from any such use of this product.

NATURE OF RESTRICTIONS: This product is for retail sale to and use only by appropriately provincially licensed persons 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. Consult local pesticide regulatory authorities about use permits which may be required. This product must be stored away from lodging for humans, animal quarters and normal work areas to avoid inadvertent exposure.

RESTRICTED USES: DEGESCH MAGTOXIN® GRANULES MAY ONLY BE USED IN CONJUNCTION WITH THE DEGESCH PHOSPHINE GENERATOR. DEGESCH MAGTOXIN® GRANULES may not be applied directly to warehouses, containers, silos, railcars, tarped structures, rodent burrows or any of the other sites in which metal phosphide fumigants are approved for use. The MAGTOXIN® GRANULES may not be applied to raw or any other type of commodity. (MAGTOXIN® GRANULES may only be used in conjunction with the DEGESCH Phosphine Generator).

For the treatment of space, grain pests in stored barley, cocoa beans, coffee beans, corn, cotton seeds, dates, dried peas, lentils, millet, nuts in shells, oats, peanuts, popcorn, rice, rye, sorghum, soybeans, sunflower seeds, triticale, wheat, all processed foods and feeds. Magtoxin® Granules may also be used to fumigate bagged, packaged or treated cereal, grass, sorghum or small legume seeds destined for planting use only. Even distribution throughout the commodity is essential for good results. Refer to the Applicator's Manual for detailed Precautions, Recommendations and Directions for Use.

The time of required exposure is as follows:

Below 5°C	Do not fumigate
at 5-12°C	10 days are required
at 13-15°C	5 days are required
at 16-20°C	4 days are required
above 20°C	not less than 3 days

A 48-hour postfumigation aeration period for the raw agricultural commodity (RAC) is required to ensure that phosphine residues fall within the maximum residue limit (MRL). For tobacco, aeration on hogsheads should be not less than three days; on any other type of storage, two days. Under no circumstances shall food, feed, bagged commodities and or raw agricultural commodities that may be used directly as food come into contact with aluminum or magnesium phosphide.

Phosphine gas may be hazardous to birds nesting on or near warehouses. Carefully inspect the outside of the structure prior to application of the fumigant to ensure the absence of nesting birds.

This product is not to be used for vacuum fumigations.

Phosphine will corrode certain metals, especially at high concentrations and humidities. Protection or removal of wiring, sensitive equipment or precious metals is recommended under these conditions.

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1. INTRODUCTION

DEGESCH MAGTOXIN® GRANULES in conjunction with the Degesch Phosphine Generator, are used to protect stored commodities from damage by insects and rodents. Fumigation of commodities with MAGTOXIN® GRANULES in the manner prescribed on the label does not contaminate the marketed commodity.

DEGESCH MAGTOXIN® GRANULES and other magnesium phosphide-based fumigants are acted upon by atmospheric moisture or liquid water to produce hydrogen phosphide gas (phosphine, PH₃). Hydrogen phosphide gas is highly toxic to insects, vertebrate 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 MAGTOXIN® GRANULES.

MAGTOXIN® GRANULES are gray, flattened particles 1-2mm in length and width. The MAGTOXIN® GRANULES are packed in stoppered 1100cc aluminum flasks containing 850g of product. The MAGTOXIN® GRANULES containing 93% magnesium phosphide and each flask will produce 411g of hydrogen phosphide, almost 1g of hydrogen phosphide for each 2g of MAGTOXIN® GRANULES. The flasks are packed in fiberboard cases containing 21 flasks each, a total of 17.85kg of MAGTOXIN® GRANULES, equivalent to 8.63kg of hydrogen phosphide.

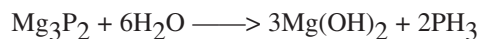
MAGTOXIN® GRANULES are supplied in gas-tight flasks and their shelf life is unlimited as long as the packaging remains intact. Once opened for fumigation, the aluminum flasks of MAGTOXIN® GRANULES may be tightly resealed and stored for future use. Storage and handling instructions will be given in detail later in the Applicator's Manual.

MAGTOXIN® GRANULES may only be used in conjunction with the Degesch Phosphine Generator. DEGESCH MAGTOXIN® GRANULES may not be used in the manner conventionally employed with other metal phosphide fumigants. That is, the MAGTOXIN® GRANULES may not be applied directly to warehouses, containers, silos, railcars, tarped structures, rodent burrows or any of the other sites in which metal phosphide fumigants are approved for use. They may not be added directly to raw or any other type of agricultural commodity.

The Degesch Phosphine Generator is an automatic device in which the MAGTOXIN® GRANULES are hydrolyzed with liquid water under an atmosphere of carbon dioxide. The warm gas mixture of phosphine and carbon dioxide is cooled with liquid water and diluted in a separate chamber with air to a mixture containing 1.8% (v/v) or less. This gas mixture may be used directly for fumigations or may be diluted further with air from an auxiliary fan and pumped into silos or other structures where commodities are stored.

The reaction of liquid water with MAGTOXIN® GRANULES inside the Generator is very rapid and complete. Less than 10ppm PH₃ remain in the spent solid residual from the Degesch Generator. The water used to flush the spent solids from within the Degesch Generator is purged with fresh air before discharge and, therefore, contains only minute traces of dissolved hydrogen phosphide gas. These are not hazardous wastes. Additional deactivation of wastes produced by the Degesch Generator is not required. However, partially spent or unexposed MAGTOXIN® GRANULES are quite reactive and will require special care. Precautions and instructions for further deactivation and disposal are given later in this Manual.

The following chemical reactions are carried out with the Degesch Phosphine Generator:



A summary of safety recommendations is outlined below:

SAFETY RECOMMENDATIONS SUMMARY

1. Carefully read, understand and obey instructions on the label.
2. Except in case of an emergency, there is no need to enter a structure being treated using the Degesch Phosphine Generator. Never enter a treated, unaerated structure alone. At least two persons, a certified applicator and trained person, or two trained persons under the direct supervision of a certified applicator must be present during fumigation of structures when entry into the structure for application of the fumigant is required.
3. Appropriate respiratory protection must be worn during all following operations: initiation of aeration and after aeration when testing prior to reentry, during deactivation of unreacted granules, and attending to spills and leaks.
4. The certified applicator must maintain visual and/or voice contact with all fumigation workers during the application of the fumigants.
5. Wear dry gloves of cotton or other material if contact with metal phosphides is likely.
6. Never open flasks of metal phosphide fumigants in a flammable atmosphere. Upon opening, hydrogen phosphide in the head-space of container might ignite spontaneously if the concentration is high enough and trigger a secondary explosion.
7. Piling of metal phosphide fumigants or the addition of liquid is prohibited (except, of course, MAGTOXIN® GRANULES will contact water in the Degesch Generator).
8. Dispose of empty containers, spent residual solids and water from the Degesch Generator in a proper manner consistent with label instructions and local and provincial ordinances.
9. Do not use containers for metal phosphide fumigants for any purpose other than recycling or reconditioning.
10. Post warning placards on fumigated areas as per instructions in Section 8.
11. 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.
12. Hydrogen phosphide fumigants are not to be used for vacuum fumigations.
13. Exposure to hydrogen phosphide must never exceed the eight-hour TWA of 0.3 ppm or the Short Term Exposure Limit (STEL) of 1.0 ppm. This standard applies to all persons in the treatment area.
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 hydrogen phosphide must be aerated for 48 hours prior to being offered to the end consumer. Under no circumstances shall food, feed, bagged commodities and/or raw agricultural commodities that may be used directly as food come into contact with aluminum or magnesium phosphide.
15. Transport of incompletely aerated commodities to a new site is permissible by rail or ship only, and the new storage site must be placarded if its concentration in phosphine is above 0.3 ppm. Trucks, vans, trailers and similar transport vehicles cannot be moved over public roads or highways until they are aerated and the warning placards removed. If workers must handle incompletely aerated commodity, or are indoors (e.g. an enclosed elevator head) they are to wear appropriate respiratory protection (see Respiratory Protection section).
16. Keep containers of MAGTOXIN® GRANULES tightly closed except while removing product for application to the Degesch Phosphine Generator.
17. Protect materials containing metal such as copper, silver, gold and their alloys and salts from corrosive exposure to hydrogen phosphide.
18. MAGTOXIN® GRANULES and/or its reacted residue must not contact any agricultural commodity.
19. Pre-exposure screening of employees to detect impaired pulmonary function is recommended. Any employees developing this condition should be examined by a physician.
20. MAGTOXIN® GRANULES may only be used in conjunction with the Degesch Phosphine Generator. They may not be applied in the manner of other metal phosphide fumigants.
21. Person supervising the fumigation must be a provincially licensed fumigator. Personnel assisting must be trained in the use of metal phosphide fumigants. Never allow uninstructed personnel to handle MAGTOXIN® GRANULES or operate the Degesch Generator.
22. The person operating the Degesch Generator must be thoroughly trained in its use.
23. The Degesch Generator should never be set-up in an enclosed (indoor) area. The Degesch Generator is meant to be installed outside the treatment area.
24. Theft of products: Immediately report to the local police department thefts of metal phosphide fumigants.
25. Registrant must be informed of any incident involving the use of this product.

2. FIRST AID

Symptoms of over-exposure are headache, dizziness, nausea, difficult breathing, vomiting, and diarrhea. In all cases of over-exposure, get medical attention **IMMEDIATELY**. Take victim to a doctor, emergency treatment facility or poison control centre, bringing this Applicator's Manual. Take container, label or product name and Pest Control Product Registration Number with you when seeking medical attention.

If the gas or granules from MAGTOXIN® GRANULES is inhaled:

Get exposed person to fresh air. Keep warm and make sure person can breathe freely. If breathing has stopped, call 911, give artificial respiration by mouth-to-mouth or other means of resuscitation. Do not give anything by mouth to an unconscious person. Call a poison control centre or doctor immediately for further treatment advice.

If MAGTOXIN® GRANULES are swallowed:

Induce vomiting by touching back of throat with finger. Do not give anything by mouth if victim is unconscious or not alert. Contact physician or poison control centre immediately.

If granules from MAGTOXIN® GRANULES 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 for 15-20 minutes. Call a poison control centre or doctor for further treatment advice.

If dust from MAGTOXIN® GRANULES get 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 centre or doctor for treatment advice.

If MAGTOXIN® GRANULES become trapped inside clothing:

Remove clothing, wash hands and exposed skin thoroughly, shower and change into clean clothing.

HOT LINE NUMBER

Have the product container, label or Applicator's Manual with you when calling a poison control centre, 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, GARDEX CHEMICALS, LTD. 416-675-1638. For all other chemical emergencies, please contact CHEMTREC – 1-800-424-9300 or Canadian Transport Emergency Centre (CANUTEC) 613-996-6666.

3. TOXICOLOGICAL INFORMATION

Magnesium phosphide Granules or dust will react with moisture from the air, acids and many other liquids to release hydrogen phosphide (phosphine, PH₃) 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, and 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 colour), 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 hyperaemia (excess of blood in a body part), small perivascular brain hemorrhages and brain edema (fluid in brain). Metal phosphide fumigants are poisonous if swallowed. Ingestion can cause lung and brain symptoms, but damage to 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 colour) 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/her 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 haemoconcentration, 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 haemodialysis is necessary. There is no specific antidote known for this poisoning.
3. Mention should be made 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.

4. PRECAUTIONS

4.1 **DANGER: Hazards to Humans, Domestic Animals and Nesting Birds – KEEP OUT OF REACH OF CHILDREN.**

If the pest control product is to be used on a commodity that may be exported to the U.S. and you require information on acceptable residue levels in the U.S., visit CropLife Canada's web site at www.croplife.ca

Magnesium phosphide from DEGESCH MAGTOXIN® GRANULES or its dust may be fatal if swallowed. Do not get in eyes, on skin or on clothing. Do not eat, drink or smoke while handling magnesium 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, PH₃) which is an extremely toxic gas. If a garlic odour is detected, refer to the Industrial Hygiene Monitoring (Section 6) of the Applicator's Manual for appropriate monitoring procedures. Pure hydrogen phosphide gas is odourless; the garlic odour is due to a contaminant. Since the odour of hydrogen phosphide may not be detected under some circumstances, the absence of a garlic odour does not mean that dangerous levels of hydrogen phosphide gas are absent. Observe proper reentry procedures specified elsewhere on the label to prevent overexposure. In situations where ventilation of buildings is required following fumigation (e.g. warehouses), phosphine gas may pose a potential hazard to small birds (e.g. swallows) nesting on or near those structures. Therefore, carefully inspect the outside of the structure prior to application of the fumigant to ensure the absence of nesting birds.

4.2 **Physical and Chemical Hazards**

Magnesium phosphide-based fumigants such as MAGTOXIN® GRANULES and their partially spent materials will release hydrogen phosphide if exposed to moisture from the air or if they come into contact with water, acids and many other liquids. Magnesium phosphide is considerably more reactive than is aluminum phosphide and will liberate gas more rapidly. This is particularly true in the presence of liquid water and at higher temperatures. 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. Explosions can occur under these conditions and may cause severe personal injury. **Never allow the buildup of hydro-**

gen 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. Piling of metal phosphide fumigants or the addition of liquid to the product is prohibited (except, of course, Magtoxin® Granules will contact water in the Degesch Generator). 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 flasks of magnesium 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 flasks of the MAGNESIUM GRANULES, point the flask away from the face and body and slowly loosen cap. Although the chances for a flash are very remote, never open containers of metal phosphide fumigants in a flammable atmosphere. These precautions will also reduce the fumigator's exposure to hydrogen phosphide.

Pure phosphine (hydrogen phosphide) gas is practically insoluble in water, fats and oils, and is stable at normal fumigation temperatures. However, phosphine will corrode copper and precious metals at high concentrations or humidities. Protection or removal of wiring, sensitive equipment or precious metals is recommended under these conditions. 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.

4.3 ENVIRONMENTAL HAZARDS

DO NOT contaminate irrigation or drinking water supplies or aquatic habitats such as lakes, rivers, sloughs, ponds, prairie potholes, creeks, marshes, streams, reservoirs and wetlands by cleaning of equipment or disposal of wastes.

5. PROTECTIVE CLOTHING

Wear dry gloves of cotton or other breathable material if contact with MAGTOXIN® GRANULES or its dust is likely. Wear a loose fitting long sleeve shirt, long pants, shoes and socks. After fumigation activities remove all protective clothing, aerate in a well-ventilated area then wash thoroughly, separately, before re-use.

If **Magtoxin®** Granules or dust become trapped inside clothing, remove clothing, wash hands and exposed skin thoroughly, shower and change into clean clothing.

6. RESPIRATORY PROTECTION

6.1 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 to be worn upon reentry into a partially aerated structure, (e.g. upon initiation of aeration or after aeration when testing for re-entry), and when deactivating unreacted granules by the "wet" method and when attending to spills and leaks. 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.

The respiratory protection must fit properly, any obstruction to a proper fit should be removed (e.g. beard, long sideburns).

*Information on hydrogen phosphide (phosphine, PH₃) detector tubes may be obtained from your distributor.

6.2 Permissible Gas Concentration Ranges for Respiratory Protection Devices

A NIOSH/MSHA approved, air-purifying full-face gas mask with a chin style mounted canister approved for phosphine OR a NIOSH/MSHA approved supplied-air respirator with a full-face piece must 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 and operated in a positive pressure mode. Observe provincial pesticide regulations.

6.3 Requirements for Availability of Respiratory Protection for outside applications

Respiratory protection must also be available for applications from outside the area to be fumigated, including those using the DEGESCH Phosphine Generator. The DEGESCH Generator may **never** be used to apply phosphine from inside the structure to be fumigated. Observe and follow all Provincial pesticide regulations.

7. APPLICATOR AND WORKER EXPOSURE

7.1 Hydrogen Phosphide Exposure Limits

Exposure to hydrogen phosphide must never exceed the eight hour Time-Weighted Average (TWA) of 0.3 ppm or the 15 minute Time-Weighted Short Term Exposure Limit (STEL) of 1.0 ppm. All persons in the treated site and in adjacent areas are covered by this exposure standard. Periodic gas measurements should be made in the worker's breathing zone using phosphine detector tubes or another suitable detector, unless they are protected by a NIOSH/MSHA approved supplied air respirator operated in a positive pressure mode.

The level of phosphine gas may be higher at the core of the commodity than the surrounding air. Monitoring is required when unloading or otherwise disturbing a commodity that has been fumigated to ensure that liberation of gas from the treated commodity does not result in unacceptable levels of hydrogen phosphide.

7.2 Application of Hydrogen Phosphide Using the Degesch Generator

Use of the Degesch Phosphine Generator virtually eliminates exposure to the license applicator since the gas is generated internally and pumped into the structure through a system which is essentially gas-tight. Gas-tight stoppered flasks are opened one at a time, for very brief periods during addition of MAGTOXIN® GRANULES to the Degesch Generator. The Degesch Generator is most often positioned in open air alongside the storage under treatment.

Care must be taken not to expose the MAGTOXIN® GRANULES in liquid water during additions to the Degesch Generator. Do not attempt to apply the MAGTOXIN® GRANULES to the Generator in situations where rain condensate or other sources of liquid water can come into contact with them. Adequate NIOSH/MSHA approved respiratory protection must be available in case of an emergency.

7.3 Leakage from Fumigated Sites

Hydrogen phosphide is highly mobile and given enough time may penetrate seemingly gas-tight materials such as concrete and cinderblock. Therefore, adjacent areas likely to be occupied (e.g. around the DEGESCH generator) should have periodic gas measurement taken using phosphine detector tubes or other approved detection apparatus to ensure that significant leakage has not occurred. Sealing of the fumigated site and/or airflow in the occupied areas must be sufficient to meet exposure standards.

7.4 Aeration and Re-entry

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 phosphine 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. A NIOSH/MSHA approved self-contained breathing apparatus with a positive pressure mode must be worn during testing of the phosphine level and during initiation of aeration, if re-entry of the fumigated structure is necessary.

7.5 Handling Un aerated Commodities

Exposure to hydrogen phosphide must never exceed the eight-hour Time-Weighted-Average of 0.3 ppm or the 15-minute Time-Weighted Short-Term Exposure Limit (STEL) of 1.0 ppm during moving, storage or processing of incompletely aerated commodities.

The level of phosphine gas may be higher at the core of the commodity than the surrounding air. Monitoring is required when unloading or otherwise disturbing a commodity that has been fumigated to ensure that liberation of gas from the treated commodity does not result in unacceptable levels of hydrogen phosphide.

7.6 Industrial Hygiene Monitoring

Periodic gas measurements should be made in the worker's breathing zone using phosphine detector tubes or another suitable detector, unless they are protected by a NIOSH/MSHA approved air supplied air respirator operated in a positive pressure mode.

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, to verify whether the appropriate respirator is being worn during fumigation within a structure and whether respiratory protection is required upon re-entry after aeration. This monitoring is mandatory although, once exposures have been adequately characterized, subsequent monitoring is not routinely required. However, spot checks should be made occasionally, especially if conditions change significantly or if an unexpected garlic odour is detected. Gas measurements should be made in the worker's breathing zone. Monitoring is not required for outdoor operations.

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. Information on hydrogen phosphide (phosphine, PH₃) detector tubes and other detection equipment may be obtained from your distributor.

8. PLACARDING OF FUMIGATED AREA

The applicator must placard or post all entrances to the structures under fumigation with placards at least 35cm long and 25cm wide that are made of substantial material that can be expected to withstand adverse weather conditions bearing the following information.

1. The signal word **DANGER** in letters at least 7 cm high and the **SKULL AND CROSSBONES** symbol in red.
2. The statement "Area and/or commodity under fumigation, **DO NOT ENTER**"
3. The statement, "This sign may only be removed after the fumigated area is completely aerated (contains 0.3 ppm or less of hydrogen phosphide gas). Workers must not be exposed to more than 0.3 ppm hydrogen phosphide."
4. The date and time fumigation begins, date, and time which aeration can begin.
5. Name of fumigant used.
6. Name, address and telephone number of the licensed applicator.
7. Placards must bear a 24-hour emergency response telephone number.

All entrances to the fumigated and deactivation areas 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 area or 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.

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

9. DIRECTIONS FOR USE

9.1 General

It is a violation of the Pest Control Products Act to use this product in a manner inconsistent with its labeling.

- 9.1.1 DEGESCH MAGTOXIN® GRANULES is a Restricted Use Pesticide due to the acute inhalation toxicity of hydrogen phosphide (phosphine, PH₃) gas. This product is for retail sale to and use only by provincially licensed 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 provincially licensed applicator.

Physical presence means on site or on the premises. Read and follow the label and the DEGESCH America, Inc. Applicator's Manual that contains complete instructions for the safe use of this pesticide.

- 9.1.2 MAGTOXIN® GRANULES 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. 153 Triangle Drive P. O. Box 116 Weyers Cave, VA 24486 540-234-9281/800-330-2525 Internet: www.degeschamerica.com E-Mail: degesch@degeschamerica.com	Gardex Chemicals Ltd. 7 Meridian Road Etobicoke, Ontario Canada M9W 4Z6 416-675-1638
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Persons working with MAGTOXIN® GRANULES should be knowledgeable of the hazards of this product and trained in the use of required respiratory equipment and detector devices, emergency procedures, and use of this fumigant.

- 9.1.3 MAGTOXIN® GRANULES may only be used in conjunction with the Degesch Phosphine Generator. DEGESCH MAGTOXIN® GRANULES may not be applied directly to warehouses, containers, silos, railcars, tarped structures, rodent burrows or any of the other sites in which metal phosphide fumigants are approved for use. The MAGTOXIN® GRANULES may not be applied to raw or any other type of commodity.

- 9.1.4 Except in the case of an emergency, there is no need to enter a structure which is being fumigated using the Degesch Phosphine Generator. At least two persons, a certified applicator and trained person, or two trained persons under the direct supervision of a certified applicator, must be present and must wear the proper safety equipment when a structure that is under fumigation is to be entered. Only one trained person is required to be present when the Degesch Generator is used to apply hydrogen phosphide from outside the area to be treated.

The certified applicator must maintain visual and/or voice contact with all fumigation workers during the application of the fumigants.

- 9.1.5 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.
- 9.1.6 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. Phosphine gas may be hazardous to birds nesting on or near warehouses. Carefully inspect the outside of the structure prior to application of the fumigant to ensure the absence of nesting birds.
- 9.1.7 Wear dry gloves of cotton or other material while handling DEGESCH MAGTOXIN® GRANULES. Wash hands thoroughly after use.
- 9.1.8 Hydrogen phosphide gas may flash at concentrations above its flammable limit. Therefore, never open containers of metal phosphide fumigants 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.
- 9.1.9 Piling of metal phosphide fumigants or the addition of liquid to the product is prohibited (except, of course, Magtoxin® Granules will contact water in the Degesch Generator). Piling of MAGTOXIN® GRANULES or dust from their fragmentation or addition of liquid water may speed up the reaction, cause a temperature increase and confine the gas so that ignition could occur.
- 9.1.10 As much as is possible, protect unused MAGTOXIN® GRANULES from excessive exposure to atmospheric moisture during introduction to the DEGESCH Generator. Due to the possible buildup of pressure, use caution when reopening partially used containers of Magtoxin® Granules.
- 9.1.11 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 fumigations with phosphine.
- 9.1.12 Respiratory protection approved for the concentration to which the fumigator will be exposed must be available if the treated structure is to be entered prior to aeration. Respiratory protection need not be worn, but must be available for uses such as outdoor application use of the DEGESCH generator, even if exposure above allowable limits is not expected. 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 and operated in a positive pressure mode.
- 9.1.13 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.

9.2 Pests Controlled

Phosphine gas from MAGTOXIN® GRANULES has been found effective against the following pests and their pre-adult stages - that is, eggs, larvae and pupae:

almond moth	flat grain beetle	mice
Angoumois grain moth	flour beetle	nematodes
bean weevil	fruit flies (small)	pink bollworm
bees	grain moth	raisin moth
cadelle	granary weevil	red flour beetle
cereal leaf beetle	greater wax moth	rice weevil
cigarette beetle	hairy fungus beetle	rodents
cockroaches	Hessian fly	rusty grain beetle
confused flour beetle	Indian meal moth	saw-toothed grain beetle
dermestid beetles	Khapra beetle	spider beetles
dried fruit beetle	lesser grain borer	tobacco moth
dried fruit moth	maize weevil	yellow meal worm
drug store beetle	Mediterranean flour moth	wood borer
European grain moth	merchant grain beetle	

Rodent pests may also be controlled using Magtoxin® Granules. Although it is possible to achieve total control of the listed 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 pests 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, and exposure periods lengthened, proper application followed and temperature and humidity conditions must be favorable.

9.3 Exposure Conditions

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

<u>Temperature</u>	<u>MAGTOXIN® GRANULES</u> <u>Minimum Exposure Periods</u>
below 5°C (40°F)	not recommended
5-12°C (40° - 53°F)	4 days (96 hours)
12-20°C (54° - 68°F)	3 days (72 hours)
above 20°C (68°F)	2 days (48 hours)

The length of the fumigation must be great enough so as to provide for adequate control of the pests, which infest the commodity being treated. The proper length of the fumigation period will vary with exposure conditions since, in general, insects/pests are more difficult to control at lower temperatures. Fumigations of temperatures below 5°C (40°F) are not recommended. However, since production of hydrogen phosphide by the Degesch Generator is rapid and complete, regardless of ambient temperatures, it is often possible to achieve satisfactory control under cooler conditions, if the exposure period is lengthened and/or if a higher concentration of hydrogen phosphide is used. For example, some experimental fumigations at temperatures as low as 0°C (32°F) have been successful.

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 pests 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.

Remember, exposure periods recommended in the table are minimum periods and may not be adequate to control all stored products pests under all conditions. The Degesch Generator produces phosphine gas very rapidly and completely depletes magnesium phosphide in the MAGTOXIN® GRANULES, regardless of external environmental conditions of temperature or humidity. Therefore, this is the technique of choice under conditions of low humidity and/or low temperature.

9.4 Commodities Which May be Fumigated with DEGESCH MAGTOXIN® GRANULES

MAGTOXIN® GRANULES may be used for the fumigation of listed raw agricultural commodities, animal feed and feed ingredients, processed foods, tobacco and certain other nonfood items. Under no circumstances shall any food, feed, bagged commodity and/or agricultural commodities that may be used directly as food come into contact with aluminum or magnesium phosphide.

9.4.1 Raw Agricultural Commodities, Animal Feed and Feed Ingredients Which May Be Fumigated with MAGTOXIN® GRANULES

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

Raw Agricultural Commodities include all food commodities at farm gate or harvested, i.e., not processed.

9.4.2 Processed Foods

The listed processed foods may be fumigated with MAGTOXIN® GRANULES.

Processed Foods Which May be Fumigated with MAGTOXIN® GRANULES

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 (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 (apples, dates, figs, peaches, pears, prunes, raisins and sultanas)
Processed Herbs, Spices, Seasonings and Condiments
Malt
Processed Nuts (almonds, apricot kernels, Brazil nuts, cashews, filberts, peanuts, pecans, pistachio nuts and walnuts)
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 (beans, carrots, lentils, peas, potato flour, potato products and spinach)
Yeast (including primary yeast)

9.4.3 **Nonfood Commodities, Including Tobacco**

The listed nonfood items may be fumigated with MAGTOXIN® GRANULES. Tobacco, psyllium seed and psyllium seed husks intended for drug use and certain other of the nonfood commodities should not be contacted by residual dust from metal phosphide fumigants. Only lots of psyllium seed and psyllium seed husks, intended for drug use destined for shipment to pharmaceutical manufacturers may be fumigated. Such dedicated lots may be fumigated in transport vehicles (truck trailers, railcars, and containers) prior to shipment. In addition, psyllium seed and husks may be fumigated at other locations only under direct instructions from the pharmaceutical company.

Nonfood Commodities Which May be Fumigated with MAGTOXIN® GRANULES

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 and Wood and Bamboo Products
Paper and Paper Products
Psyllium Seed and Psyllium Seed Husks intended for drug use
Dried Plants and Flowers
Seeds (grass seed, ornamental herbaceous plant seed and vegetable seed)

9.5 **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. Other conditions being equal, the same amount of phosphine is required to treat a 10,000-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 recommended dosage ranges for MAGTOXIN® GRANULES are:

dates, nuts and dried fruits
20-40g PH₃ (41-83g Granules/28m³)

all other commodities
20-140g PH₃ (41-290g Granules/28m³)
25-180g PH₃ (52-373g Granules/28m³)

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 may be required to handle the variety of fumigation situations encountered in practice.

Somewhat higher dosages are usually recommended under cooler 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 ranges used for poorly constructed buildings that cannot be sealed adequately. In certain other fumigations, proper distribution of lethal concentration of gas to reach all parts of the structure becomes a very important factor in dose selection. 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 Dosages for Various Types of Fumigations

<u>Type of Fumigation</u>	<u>Dosage Ranges</u>	
	<u>Phosphine</u> g/28m ³	<u>MAGTOXIN® GRANULES</u> g/28m ³
1. Space		
mills, warehouses, etc.	20 - 60	41 - 124
bagged commodities	30 - 60	62 - 124
dried fruits and nuts	20 - 40	41 - 82
stored tobacco	20 - 40	41 - 82
2. Bulk Stored Commodities		
vertical storages	30 - 60	62 - 124
tanks	30 - 70	62 - 145
flat storages (loose construction)	50 - 145	104 - 300
farm grain bins	70 - 145	145 - 300
bunkers and tarped ground storages	30 - 80	62 - 165
railcars, trailers, containers	30 - 65	62 - 135
barges	50 - 145	104 - 300
shipholds	30 - 65	62 - 135

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.

9.6 Application Procedures

9.6.1 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 spent 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. Phosphine gas from the Degesch Generator should be applied so as to provide effective gas concentrations throughout the treatment area. When phosphine is not applied uniformly to a bulk commodity (injection of phosphine at one point into a tall silo or ship's hold, for example), exposure times should be lengthened to allow for penetration of gas throughout the treatment area.
3. The storage structure should be sealed so as to maintain a suitable gas concentration over the time period required for control of insect or rodent pests. It is recommended that, prior to fumigation, a pressure test be performed inside the structure to be fumigated to ensure that it is properly sealed. The area around the DEGESCH generator tubing/pipes entering the fumigated structure should be properly sealed with duct tape. The opening where the tubing enters fumigated area should be quickly and properly sealed after tubing is removed.
4. Ideally, gas concentrations should be high enough and exposure periods long enough to provide for adequate control of insect or rodent pests.
5. Phosphine concentrations injected into the structure should not be applied to confined spaces where the concentration of hydrogen phosphide exceed the lower flammable limit of 1.8% v/v.

6. If phosphine gas from the DEGESCH Generator is not re-circulated, or if auxiliary air from an external source is applied, leave an opening of about .75m² in the top of the storage. Opening must be sealed upon completion of phosphine injection. Any worker present in the vicinity must wear appropriate respiratory protection or the areas must be monitored on a continuous basis (i.e. device with alarm, which sounds when atmospheric concentration reaches 0.3 ppm phosphine).
7. Observe the precautionary and safety statements as mentioned in Section 5 Respiratory Protection and Section 6 Applicator and Worker Protection.
8. Phosphine will corrode certain metals, especially at high concentrations and humidities. Protection or removal of wiring, sensitive equipment or precious metals is recommended under these conditions.
9. Approved respiratory protection must be worn if reentry of the treated area is necessary before complete aeration (e.g., for taking gas readings).

9.6.2 **Fumigation of Warehouses, Mills and Food Processing Plants**

1. Using information provided in the Applicator's Manual and Label, calculate the dosage of phosphine to be applied and the duration of the fumigation based upon the volume of the building, the general tightness of the structure and the air and/or commodity temperature.
2. Carefully seal the space to be fumigated. Doors leading to the fumigated space should be closed, sealed, locked and placarded with fumigation warning signs.
3. Attach the outlet and inlet piping from the Degesch Generator so that air from inside the structure is pulled into the Degesch Generator to dilute the phosphine-carbon dioxide mixture and then injected back into the space to be treated.
4. Add MAGTOXIN® GRANULES to the Degesch Generator and inject phosphine into the structure. Make sure beforehand that the funnel through which the MAGTOXIN® GRANULES are applied and the receiving chamber for the MAGTOXIN® GRANULES are not wet. Do not allow the MAGTOXIN® GRANULES to contact water.
5. Although phosphine will diffuse very rapidly through open air, it is a good idea to continue re-circulation of air from the Degesch Generator until adequate concentrations of phosphine are attained throughout the structure, as determined by gas concentration readings. Phosphine may be injected into the structure at several points if necessary to achieve more uniform distribution of the gas.
6. Do not enter the fumigated structure without appropriate respiratory protection until phosphine concentration has reached 0.3 ppm or below.
7. Remove fumigation placards only after aeration is complete (see section 8, placarding of fumigated areas).

9.6.3 **Fumigation of Vertical Storages (farm bins, concrete upright bins and other silos)**

1. Close all openings and seal cracks to make the structure as airtight as possible. Prior to the fumigation, seal the vents near the bin top which connect to adjacent bins.
2. Place warning placards on the discharge gate and on all entrances.

3. Smaller bins and silos may be fumigated by re-circulation of phosphine gas produced by the Degesch Generator, in a manner similar to that employed for warehouses. Alternatively, they may be treated by adding gas from the Degesch Generator, without re-circulation into the bottom of the bin or silo. Addition is continued until phosphine is detected at the opening (.75 m²) at the top of the bin/silo. Opening must be sealed at completion of phosphine injection.
4. Larger vertical storages, whose volumes greatly exceed the capacity of the fan motor (120 m³/hr., 4200 ft.³/hr.) of the Degesch Generator, will require an auxiliary air supply to distribute phosphine throughout the silo in a reasonable length of time. Depending upon the volume of the silo, the auxiliary air should have a flow rate of 5 to 10 times that of the Degesch Generator's fan, 350 to 700 cfm. Use of an auxiliary air supply will enable the addition of phosphine from the Degesch Generator and distribution of the gas throughout the structure to be complete within a few hours.
5. For fumigation of larger vertical storages, leave an opening of .75m² or more at the top of the bin/silo. This will prevent a build-up of pressure from gas pumped into the treatment area. Place a gas sampling line near the top of the bin/silo. Any worker present in the vicinity of the opening must wear appropriate respiratory protection or the area must be monitored on a continuous basis (i.e., device with alarm, which sounds when atmospheric concentration reaches 0.3 ppm phosphine).
6. Connect the outlet gas lines from the Degesch Generator and the auxiliary air supply to the bottom of the bin/silo.
7. Turn on the auxiliary air supply and then begin injection of phosphine gas from the Degesch Generator into the bin/silo.
8. Take periodic phosphine gas readings from the top of the bin/silo, particularly near the time estimated for phosphine gas to reach the top.
9. Plan the addition of MAGTOXIN® GRANULES to the Degesch Generator so that phosphine is being generated more or less continuously throughout the time estimated for phosphine gas to reach the top.
10. Turn off the auxiliary air supply and disconnect the Degesch Generator when the MAGTOXIN® GRANULES have been reacted and all the phosphine gas has been injected into the structure. Close .75m² opening.
11. More or less uniform concentrations will be reached by diffusion of phosphine gas throughout the structure within several additional hours. This may be verified by making phosphine gas readings from sampling lines placed in appropriate positions in the bin/silo.
12. Do not enter the fumigated structure without appropriate respiratory protection until phosphine concentration has reached 0.3 ppm or below. Do not remove fumigation warning placards until aeration is complete.

9.6.4 **Fumigation of Flat Storages, Bunkers and other Tarped Structures**

1. Establish a plan for application of phosphine gas depending upon the characteristics of the structure to be treated. For example, it is difficult to treat a flat storage containing grain at depths greater than above 6 m and having no aeration ducts unless the storage is sealed very carefully.
2. If the structure has no aeration ducts, the surface of the grain must be carefully tarped and remainder of the building sealed as tightly as possible.

3. Post fumigation warning placards on the treatment area and secure the area. Inject and re-circulate hydrogen phosphide gas through the aeration ducts or at points below the surface of the grain, if possible. Depending upon the size of the storage, it may be necessary to make injections of gas at several points along its perimeter.
4. It is recommended that phosphine gas concentration measurements be made at several points in the treatment area to verify the presence of lethal concentration throughout the mass for the term of the fumigation.
5. Following the introduction of the phosphine gas from the Degesch Generator, the lines to the treatment areas should be capped or sealed.
6. The fumigation warning placards can only be removed by a licensed fumigator once the aeration process has been completed. (See section 8 of the applicator's manual).

9.6.5 Tarpaulin Fumigations

1. When possible, conduct tarpaulin fumigations outside. Do not conduct outdoor fumigation of commodities in the proximity of wildlife areas.
2. An enclosure, suitable for fumigation, may be formed by covering bulk or packaged commodity with poly sheeting, of a minimum of 4 mil thickness. The sheets may be taped together to provide a sufficient width of material to ensure that adequate sealing is obtained. If the material rests on soil or flooring 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. Use plastic sheeting or tarpaulins of at least 4-mil thickness. Thicker poly sheeting is recommended to reduce the potential for loss of fumigant.
3. Place warning placards at conspicuous point on the enclosure.
4. Phosphine may be applied to the tarped stack or bunker storage of bulk commodity through slits in the poly sheeting. Connections with the tubing from the DEGESCH generator should be properly sealed with duct tape during phosphine injection. Air under the tarp should always be recirculated through the DEGESCH generator during phosphine injection. Once injection is complete, the slits in the covering should be carefully taped to prevent loss of gas once the dose has been applied.

9.6.6 Fumigation of Ships General Information

1. **IMPORTANT:** Shipboard, in-transit ship or shiphold fumigation is also governed by the Canadian Shipping Act and Transport Canada Ship Safety Regulations. Refer to and comply with those Regulations and Ship Safety Bulletins prior to fumigation. In Canada, fumigations must be carried out under the direction of a "Fumigator-in-Charge" as indicated in these regulations. **No person shall fumigate in-transit or permit in-transit fumigation in a Canadian flagship.** The decision to fumigate-in-transit on Non-Canadian flag vessels is at the discretion of the master (see Ship Safety Bulletin 13/93, Ship Fumigations Regulation's P.C. 1989-184).

2. MAGTOXIN® GRANULES are classified as restricted use pesticides due to the acute inhalation toxicity of hydrogen phosphide (phosphine, PH₃) gas. This product is for retail sale to and use only by provincially licensed personnel for those uses covered by the applicator's certification, or workers trained in accordance with the Applicator's Manual and working under the direct supervision and in the physical presence of the licensed applicator. (Physical presence means on site or on the premises). Read and follow the label and the Applicator's Manual, which contains complete instructions for the safe use of this pesticide. Reference should be made to the International Maritime Organization (IMO) Medical First Aid Guide.

Pre-Voyage Fumigation Procedures

1. Before fumigation is commenced, a notification of intention to fumigate must be given to nearest Transport Canada Ship safety office (generally, no less than 24 hours in advance). Similarly, a notice must be given for vessels in-transit of Canadian waters and stopping at a Canadian Port. Prior to fumigating a vessel for in-transit cargo fumigation, the master of the vessel, or his/her representative, and the licensed fumigator must determine whether the vessel is suitably designed and configured so as to allow for safe occupancy by the ship's crew throughout the duration of the fumigation. If it is determined that the design and configuration of the vessel does not allow for safe occupancy by the ship's crew throughout the duration of the fumigation, then the vessel must not be fumigated unless all crew members are removed from the vessel. The crewmembers must not be allowed to reoccupy the vessel until the vessel has been properly aerated to 0.3 ppm or below and a determination has been made by the master of the vessel and the licensed fumigator that the vessel is safe of occupancy.
2. The person responsible for the fumigation must notify the master of the vessel, or his/her representative, of the requirements: 1) relating to the use of personal respiratory protection equipment*; 2) relating to the use of detection equipment; and 3) that a person qualified in the use of this equipment must accompany the vessel with cargo under fumigation. Emergency procedures, cargo ventilation, periodic monitoring and inspections, and first aid measures must be discussed with and understood by the master of the vessel or his/her representative.

*Personal respiratory protection means a NIOSH/MSHA approved air purifying full face gas-mask with a chin style mounted canister approved for phosphine OR a NIOSH/MSHA approved supplied-air respirator with a full face piece for phosphine levels up to 15 ppm. A self-contained breathing apparatus (SCBA) must be worn and operated in a positive pressure mode when phosphine levels are above 15 ppm or at unknown concentrations.

3. Prior to the loading of the commodities in the shipholds, perforated piping should be installed at the base of the holds and exit ladder.
4. The Degesch Phosphine Generator will be placed on the deck and the phosphine gas out port pipe connected to the shipholds perforated piping.

Phosphine (PH₃) gas will then be pumped along with air from an auxiliary supply into the bottom of the holds. Addition of phosphine gas from the Degesch Generator and the auxiliary air is halted when hydrogen phosphide is detected at the surface of the commodity. All hatch covers and/or hatches are then tightly sealed. Even distribution of phosphine gas throughout the hold will be achieved within a few additional hours and there is no need to re-circulate the gas. Any leaks from the hold into occupied areas of the vessel can be detected within a short time after the application of hydrogen phosphide has been completed.

5. Seal all openings of the cargo hold or tank and lock or otherwise secure all openings, manways, etc., which might be used to enter the hold. The over space pressure relief system of each tank aboard tankers must be sealed by closing the appropriate valves and sealing the openings into the over space with gas-tight materials.
6. Placard all entrances to the treated spaces with fumigation warning signs as described in section 7 of this Applicator's Manual. A watchman must be posted at the gangway to keep unnecessary persons from boarding.
7. If the fumigation is not completed and the vessel aerated before the manned vessel leaves port, the Fumigator-in-Charge shall ensure that there be on board the vessel during the voyage: 1) at least four NIOSH/MSHA approved self-contained breathing apparatus (SCBA)* and four additional air bottles or combination supplied-air respirators; 2) two gas detection devices (when these devices require re-arming after use, the ship shall be equipped with 10% more spare detection tubes that are required to conduct the required testing for the duration of the voyage); and 3) a person qualified in their operation. If the fumigated area of the vessel has to be re-entered before complete aeration, approved respiratory protection must be worn.

*The total number of SCBA on board a vessel need not exceed 6, including those already on board for fire fighting, etc. and required by other regulations.

8. During the fumigation, the Fumigator-in-Charge shall ensure that a qualified person using gas or vapour detection equipment routinely tests spaces adjacent to spaces containing fumigated cargo and all regularly occupied spaces for fumigant leakage. For fumigation-in-transit, the vessel must remain alongside for a minimum of 24 hours, or the Fumigator-in-Charge must sail with the ship and remain on board for a minimum of 24 hours once fumigation has commenced. 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/her representative, of the leakage so that corrective action can be taken. At the end of the 24-hour period, final gas readings should be made and a clearance certificate issued.
9. Review with the master, or his/her representative, the precautions and procedures for the duration of the voyage. Clear written instructions must be given to the master of the ship, to the receiver of the cargo and to the authorities at the discharging port as to how to test the cargo area for gas prior to entry and removal of the placards.

In Transit Fumigation of Containers Aboard Ships

In transit fumigation of containers on ships is also governed by Transport Canada Ship Safety Regulations. Refer to and comply with these regulations prior to fumigation.

No fumigation of containers is to be commenced while the unit is on board a ship. The vessel Master must be notified and correct procedures regarding shipping documents, placarding and transport and stowage of containers under fumigation must be observed.

Application procedures for fumigation of raw commodities or processed foods in containers and other transport vehicles are described in Section 9.6.7.

Precautions and Procedures During Voyage

Using appropriate gas detection equipment, routinely 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 re-occupied.

Do not enter fumigated areas except under emergency conditions. If necessary to enter a fumigated area, appropriate personal respiratory protection equipment must be used. Never enter fumigated areas alone. At least two persons wearing the required breathing apparatus should enter, and at least one other person, wearing personal respiratory protection equipment, should be available to assist in case of an emergency.

Precautions and Procedures During Discharge

If necessary to enter a treated area 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 or below 0.3 ppm, as indicated by a suitable detector.

9.6.7 Fumigation of Railcars, Containers, Trucks, Vans and Other Transport Vehicles and Small Storages

Railcars and containers, trucks, vans and other transport vehicles shipped piggyback by rail may be fumigated in transit. Aeration of railcars, railroad boxcars or shipping containers is prohibited en route.

It is not legal to move trucks, trailers, containers, vans, etc., over public roads or highways until they have been aerated and the warning placards removed.

Transport vehicles loaded with bulk commodities to which hydrogen phosphide gas may be added directly are treated in essentially the same way as any other small storage facility. Carefully seal all vents, cracks or other leaks in the small storage facility, particularly if transport vehicles are to be fumigated in transit. Small volume storages such as transport vehicles and small tarped spaces, buildings and rooms may be treated by adding the appropriate amount of hydrogen phosphide from the Degesch Generator affixed to the space in the re-circulation mode. See Section 8 of this Applicator's Manual for recommendations on placarding. The shipper must notify the consignee if the commodity is to be shipped under fumigation with hydrogen phosphide. Attach a packet of information for the consignee on aeration techniques, date of fumigation and fumigant information.

Written notification must be provided to the receiver of railcars, railroad boxcars, shipping containers and other vehicles that are being fumigated in transit. Notification must be made prior to the actual receipt of a fumigated vehicle or container by a consignee. A copy of the applicator's manual must precede or accompany all transportation containers or vehicles.

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 trained person must perform the aeration process. The trained person must be provincially licensed or have other documented authorized training recognized by the province or territory and must be familiar with the properties of hydrogen phosphide, worker exposure limits, required personal protective equipment, symptoms and first aid treatment for hydrogen phosphide poisoning, and must know how to take gas concentration measurements. A training completion date must be logged and maintained in the employee's safety training record. Upon receipt of a fumigated commodity, it must be documented in writing that the monitoring has been conducted and that aeration has been completed.

Transfer without aeration:

Railcars, containers and other transport vehicles shipped piggyback by rail; containing commodities under fumigation may be transferred to a storage area without prior aeration. The consignee must:

1. Ensure that the worker exposure levels are not exceeded and
2. Ensure that the storage area, into which the unaerated railcar, container or transport vehicle shipped piggyback is transferred, is placarded if it contains 0.3 ppm or more hydrogen phosphide gas.

Transfer with aeration:

1. Aerate the railcar, containers or other transport vehicles shipped piggyback by rail, containing commodities under fumigation and verify that it contains no more than 0.3 ppm hydrogen phosphide.
2. Remove the fumigation warning placards after aeration is completed.
3. Ensure that worker safety limits have not been exceeded.
4. Transfer that fumigated commodity from the railcar, or containers and other transport vehicles shipped piggyback.

9.6.8 Fumigation of Storages to Control Rodents and other Non-Insect Pests

Rodents and many other non-insect pests in storages may be controlled with short-term fumigations using the DEGESCH Phosphine Generator. In contrast to insects, which generally require 3 or more days of fumigation to obtain adequate control, rodents and other non-insect pests may be controlled within 1 to 4 hours after achieving distribution of phosphine throughout the structure.

Hydrogen phosphide is a mobile gas and will penetrate all parts of the structure. A major factor in selection of dosage is the ability of the structure to retain hydrogen phosphide gas for the duration of the fumigation. The duration of the fumigation will commence upon detection of the desired concentration of hydrogen phosphide within the structure. Dosages are based upon the total volume of the space being treated as follows:

DURATION IN HOURS	PHOSPHINE g/28M3	MAGTOXIN GRANULES g/28M3
0.5—1	440g	910g
1—2	220g	455g
2—3	110g	228g
3—4	55g	114g

10. AERATION OF FUMIGATED COMMODITIES

10.1 Foods and Feeds

Maximum Residue Limits (MRL) for hydrogen phosphide have been established at 0.1 ppm for finished foods. **A 48-hour post-fumigation aeration period for the raw agricultural commodity (RAC) is required** to ensure that phosphine residues fall within the maximum residue limit (MRL). As an alternative to this aeration period, each container of treated commodity may be analyzed for residues using accepted analytical methods. Under no conditions shall food, feed, bagged commodities and/or raw agricultural commodities, which may be used directly as foods come into contact with aluminum or magnesium phosphide.

10.2 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.

11. STORAGE INSTRUCTIONS

1. Store MAGTOXIN® GRANULES 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 MAGTOXIN® GRANULES are supplied in gas-tight re-sealable 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 the MAGTOXIN® GRANULES is virtually unlimited as long as the containers are kept tightly sealed.

12. DISPOSAL

12.1 General

Pesticide wastes are toxic. Open dumping is prohibited. Do not discharge this product, or material containing this product, into natural waterways, wetlands (swamps, bogs, marshes, potholes, etc.) or municipal wastewater collection systems. Do not contaminate water, food or feed by disposal. Proper disposal of magnesium phosphide is required to ensure minimal impact on the environment.

Unreacted or partially reacted magnesium phosphide is acutely hazardous. If these wastes cannot be disposed of according to label instructions, contact the Provincial Regulatory Agency or the Manufacturer. See also Section 13 of this manual, Spill and Leak Procedures.

The spent slurry produced by the DEGESCH generator from Magtoxin granules is not hazardous waste and may be disposed of at a sanitary landfill, or other approved sites or means with or without prior decanting. Where permissible, the slurry or the decanted water from the slurry may be poured out onto the ground. Avoid direct pouring of the slurry into a storm sewer.

Confinement of partially spent MAGTOXIN® GRANULES, as in a closed container or plastic bag, may result in a fire hazard. Small amounts of hydrogen phosphide may be given off from unreacted magnesium phosphide, and confinement of the gas may result in a flash.

Unreacted or improperly exposed MAGTOXIN® GRANULES must be further deactivated before disposal at a landfill. Granules can be deactivated either by the Dry or the Wet method.

12.2 Directions for Deactivation by the Dry Method

Small amounts of the MAGTOXIN® GRANULES from 1 to 2 kg (2 to 5 lbs.) may be deactivated by storage in a 4-litre bucket. MAGTOXIN® GRANULES should be deactivated outdoors, in a dry location away from inhabited buildings. Larger amounts of MAGTOXIN® GRANULES (about 5 kgs. or 11 lbs.) may be held for deactivation in porous cloth bags (burlap, cotton, etc.)

CAUTION: Confinement and the danger of flash may result from overfilling the ventilated or porous container. It is preferable to carry out deactivation at the fumigation site. Protect the granules from contact with water.

Placards should be posted, and the site secured to prevent unauthorized person from tampering with the deactivating granules.

Once deactivated, the granule dust may be disposed of at an approved sanitary landfill.

Caution: Transport the granule dust in open vehicles without stacking the buckets or piling the bags.

Unreacted or improperly exposed MAGTOXIN® GRANULES **must** be further deactivated before disposal at a landfill.

The spent slurry produced by the Degesch Generator from MAGTOXIN® GRANULES is not a hazardous waste and may be disposed of at a sanitary landfill, or other approved sites or means, with or without prior decanting. Where permissible, the slurry or the decanted water from the slurry may be poured out onto the ground. Avoid direct pouring of slurry or water into a storm sewer.

12.3 **Directions for Deactivation by the Wet Method**

If the contaminated material cannot be held until completely reacted by exposure to atmospheric moisture, deactivate the product by the “Wet Method” as follows:

Water is used for the wet deactivation of MAGTOXIN® GRANULES and other magnesium phosphide fumigants. Detergent solution is **not** required. In a secured, placarded area, fill several drums or other containers to be used for wet deactivation with water to within 2 to 3 cm (1”) of the top. Do **not** allow a large headspace above the surface of the water.

Magnesium phosphide reacts very vigorously with water and, therefore, only a small amount of unexposed or partially exposed MAGTOXIN® GRANULES should be wet deactivated at one time. Fresh additions may be made as soon as the vigorous reaction of the MAGTOXIN® GRANULES has subsided. **Caution: Do not use cloth bag for deactivation of unreacted granules.**

Reaction of MAGTOXIN® GRANULES with water is practically complete within just a few minutes. However, the MAGTOXIN® GRANULES should be totally immersed for 6 hours to ensure total hydrolysis.

Caution: 1) Wear appropriate respiratory protection during wet deactivation of unexposed or incompletely exposed MAGTOXIN® GRANULES. Never place metal phosphide products or their 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. Do not cover the container being used for wet deactivation.

Caution: 2) Removal of the MAGTOXIN® GRANULES from the water before they are largely deactivated may result in fire. Deactivated material may then be taken to an approved site for disposal. Dispose of the water at a sanitary landfill or other approved sites or means. Where permissible, the water may be poured out onto the ground. Avoid direct pouring into a storm sewer.

Placards should be posted, and the site secured to prevent unauthorized persons from tampering with the drums. Allow the suspension to stand for 36 hours or more. Dispose of the deactivated dust/water suspension, with or without preliminary decanting, at an approved sanitary landfill. The deactivating solution may be poured onto the ground. Avoid direct pouring into a storm sewer.

12.4 **Product Container Disposal**

The container must be cleaned prior to disposal. There are two options: 1) Triple rinse empty flasks and stoppers with water. Dispose of rinsate in a sanitary landfill, by pouring it out onto the ground or by other approved procedures. 2) Remove lids and expose empty flasks to atmospheric conditions until residue in the flasks is reacted. This should be done outdoors, away from inhabited buildings.

Once the container is clean, it may be offered for recycling or reconditioning. Alternatively, it may be made unsuitable for further use and disposed of in a sanitary landfill, or by other procedures approved by provincial and local authorities.

13. **SPILL AND LEAK PROCEDURES**

13.1 **General Precautions and Directions**

This product is highly toxic to fish, birds, and other forms of wildlife. Do not discharge directly to natural waterways, wetlands (swamps, bogs, marshes, potholes, etc.) or municipal wastewater collection systems. Do not contaminate

water, food or feed by disposal. Proper disposal of magnesium phosphide is required to ensure minimal impact on the environment. Contact the manufacturer and the provincial regulatory agency in case of a spill, and for clean-up of spills.

A spill other than incidental to the application or normal handling, may produce high levels of gas and, therefore, attending personnel must wear a NIOSH approved self-contained breathing apparatus with full facepiece operated in positive pressure mode when concentration of hydrogen phosphide is unknown. Other NIOSH/MSHA approved respiratory protection may be worn if the concentration is known, see Section 5 on respiratory protection. **DO NOT** use water at any time to clean up a spill of MAGTOXIN® GRANULES. Water in contact with unreacted metal phosphides 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 metal phosphides.

In the event of damage during shipment of the MAGTOXIN® GRANULES, return all intact aluminum flasks to fiberboard cases of other packaging, which has been suitably constructed and marked according to T.D.G.A. 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 MAGTOXIN® GRANULES may be transferred from the damaged flask to a sound metal container which should be sealed and properly labeled as magnesium phosphide. MAGTOXIN® GRANULES which have spilled or have had been exposed to air for more than a few minutes must **not** be resealed. This might result in a dangerous buildup of pressure. This material must be deactivated by the wet or dry method or by exposure to atmospheric moisture. Transport the damaged containers to an area suitable for pesticide storage for inspection. Further instructions and recommendations may be obtained, if required from the manufacturer.

14. FOR ASSISTANCE:

DEGESCH America, Inc.
153 Triangle Drive
P. O. Box 116
Weyers Cave, Virginia USA 24486
Telephone: 540-234-9281/800-330-2525
Fax: 540-234-8225
Internet: www.degeschamerica.com
E-Mail: degesch@degeschamerica.com

OR

Gardex Chemicals Ltd.
7 Meridian Road
Etobicoke, Ontario
M9W 4Z6 Canada
Telephone: 416-675-1638
Fax: 416-798-1647

OR

HOT LINE NUMBER

Have the product container label or Applicator's Manual with you when calling a poison control centre, 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, GARDEX CHEMICALS, LTD. 416-675-1638. For all other chemical emergencies, please contact CHEMTREC – 1-800-424-9300 or Canadian Transport Emergency Centre (CANUTEC) 613-996-6666.