

59209-3

9-29-1998

S 543363 350/38 11/23
S 549402 300/18
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S 549404 301/18

SEP 29 1998

Mr. Pravin C. Ashar
Inventa Corporation
990 Highland Drive, Suite 110-M
Solana Beach, CA 92075

Dear Mr. Ashar:

Subject: QUIK-FUME TABLETS, EPA Registration No., 59209-1
QUIK-FUME PELLETS, EPA Registration No., 59209-2
QUIK-FUME BAGS, EPA Registration No., 59209-3
Your Submissions of May 21, 1998, August 10, 1998, and
August 18, 1998
Quik-Fume container labels submitted on your behalf on
September 7, 1998, by United Phosphorus Ltd. of India

As we have discussed by telephone on several occasions, the claim that these products may be used to fumigate "rapeseed (including canola)" should not have been accepted by the Agency because there is no tolerance that clearly applies to that use pattern. The people who reviewed the manual that was accepted on January 15, 1997, indicated to me that they probably did not compare that revised manual to the published tolerances for Phosphine generated from Aluminum Phosphide. When I checked earlier this year, I could not establish that rapeseed was covered by an appropriate tolerance.

The proposed revised applicators' manual submitted on August 10, 1998, lacks the site claim "rapeseed (including canola)". These additional food uses do not seem to be covered by specific tolerances for Phosphine generated from Aluminum Phosphide: triticale and vegetable seeds. However, these sites appear to fall into crop groupings which are covered.

The changes listed below must be made to the final printed version of the applicators' manual.

1. Delete "grain seed," from the last bulleted item under "**3. Nonfood Commodities, including Tobacco**" under "**D. COMMODITIES WHICH MAY BE FUMIGATED WITH QUIK-FUME**" (page 9). Grain seed usually is not considered to be a nonfood commodity, although it seems virtually impossible that any Phosphine from the fumigation of grain seed would be found in the crop resulting from the planting of that seed.
2. Change "press on" to "press-on" in last sentence of item "9." of "**F.7.b.**" ("**Procedures for Hopper Rail cars – Round Hatch**", page 15.). Make the same change to last sentence of item "8." of "**F.7.c.**" ("**Procedures for Hopper Rail cars -- Slot Hatch**", page 15.)
3. Change "jams" to "jambs" in second sentence of item "3." of "**F.7.d.**" ("**Procedures for Box Cars**", page 15.).
4. Change the number for the section "**Tarpaulin and Bunker Fumigations**" from "4." back to "8.".
5. Change the number for the section "**Fumigation of Ship**" from "5." back to "9.".
6. Delete the last sentence of item "2." under "**General Information**" heading of "**5. Fumigation of Ships**" (page 18). The sentence introduces some confusion regarding which manual (yours or USDA's) "may also be followed voluntarily". As all users are required to follow your manual, no statement should imply that your manual may be followed voluntarily. However, the text which precedes the sentence in question indicates that procedures outlined in USDA's manual "must be followed" except in the unlikely event that a shipper or fumigator actually wants the shipment to be designated "infested". Without having USDA's handbook in hand, I cannot judge to what extent it might conflict with your manual, but it seems clear enough that the "may also be followed voluntarily" sentence should be removed.
7. Change the number for the section "**Fumigation of Barges**" from "6." to "10.".
8. Change the number for the section "**Fumigations in Small Sealable Enclosures**" from "7." to "11.".
9. Change the number for the section "**Treatment of Beehives, Supers And Other Beekeeping Equipment**" from "8." to "12.".
10. Change the number for the section "**Burrowing Pest Control**" from "9." to "13.".

We have not reviewed the container labels submitted on August 18, 1998, for the distributor products 59209-1-2548, 59209-1-70506, and 59209-3-70506. As I indicated in my telephone message on August 24, 1998, we cannot stamp distributors' labels. It is your responsibility to make sure that distributors' labels correspond, as required, with your labels.

The container label for 59209-1 submitted for you on September 7, 1998, by United Phosphorus Ltd. of India is generally acceptable. Change the final printed label as indicated below.

1. Replace the third sentence ["Do not apply . . . potholes)"] of the "**ENVIRONMENTAL HAZARDS**" section with

"Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark."

This change was indicated in PR Notice 93-3, as modified by PR Notice 93-8.

2. Delete the quotation marks from the "It is a violation . . . labelling" statement which appears immediately under the heading "**DIRECTIONS FOR USE**"

The container label for 59209-2 submitted by you on August 18, 1998, is generally acceptable. Make the label changes indicated below to the final printed label.

1. Replace the third sentence ["Do not apply . . . potholes)"] of the "**ENVIRONMENTAL HAZARDS**" section with

"Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark."

2. Delete the quotation marks from the "It is a violation . . . labelling" statement which appears immediately under the heading "**DIRECTIONS FOR USE**"

The 6-bag and 10-bag container labels for 59209-3 submitted for you on September 7, 1998, by United Phosphorus Ltd. of India are generally acceptable. Change the final printed versions of these labels as indicated below.

1. Between the current second and third sentences of "**ENVIRONMENTAL HAZARDS**", insert the following sentence:

Do not use QUIK-FUME BAGS in animal burrows."

Note that the applicator's manual only provides directions for applying tablets and pellets to animal burrows.

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2. Delete the quotation marks from the "It is a violation . . . labelling" statement which appears immediately under the heading "**DIRECTIONS FOR USE**"

Submit one copy of the final printed container label(s) for each product and submit 3 copies of the final printed applicator's manual before releasing these products for shipment.

Sincerely yours.

William W. Jacobs, Ph. D.
Insecticide-Rodenticide Branch
Registration Division (7505C)

enclosures

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS
KEEP OUT OF REACH OF CHILDREN
DANGER/POISON

Aluminum phosphide powder, may be fatal if swallowed. Do not get in eyes, on skin or on clothing. Do not eat, drink or smoke while handling aluminum phosphide fumigants. If a sealed container is opened, or if the material comes into contact with moisture, water or acids, extremely toxic phosphine gas will be released. If a garlic odor is detected, refer to the Applicator and Worker Exposure section of the applicator's manual for appropriate monitoring procedures. Pure phosphine gas is odorless; the odor is due to a contaminant. Since an odor may not be detected under certain circumstances, the absence of a garlic odor does not mean that phosphine gas is absent. Observe proper application, aeration, reentry and disposal procedures specified elsewhere in the labeling to prevent overexposure.

NOTE TO PHYSICIAN

Aluminum phosphide bags react with moisture in the air, acids and many other liquids to release phosphine gas. Mild exposure by inhalation causes malaise, ringing of ears, fatigue, nausea and pressure in the chest which are relieved by removal to fresh air.

Moderate poisoning causes weakness, vomiting, epigastric pain, chest pain, diarrhea and dyspnea. Severe poisoning may occur in a few hours to several days, resulting in pulmonary edema and may lead to dizziness, cyanosis, unconsciousness and death.

In sufficient quantity, phosphine affects the liver, kidneys, lungs, nervous system and circulatory system. Inhalation can cause lung edema and hyperemia, small perivascular brain hemorrhages and brain edema. Ingestion can cause lung and brain symptoms, but damage to the viscera 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; and (3) kidney hematuria and anuria. Pathology is characteristic of hypoxia. Frequent exposure over a period of days or weeks may cause poisoning. Treatment is symptomatic. For further information, contact the nearest National Poison Control Center.

ENVIRONMENTAL HAZARDS

This product is very highly toxic to wildlife. Non-target organisms exposed to phosphine gas in burrows will be killed. Do not apply directly to water or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water by cleaning of equipment or disposal of waste.

ENDANGERED SPECIES RESTRICTIONS - Refer to the applicator's manual.

PHYSICAL AND CHEMICAL HAZARDS

Aluminum phosphide will release phosphine gas if exposed to moisture from the air or if it comes into contact with water, acids and many other liquids. Piling of the bags may cause a temperature increase and confine the release of gas so that ignition could occur.

Always open containers of aluminum phosphide products outdoors or indoors, in the presence of appropriate mechanical ventilation as under certain conditions they may flash upon opening. When opening, point the container away from the face and body, and slowly open. Although the chances for flash are very remote, never open these containers in a flammable atmosphere. These precautions will also reduce the applicator's exposure to phosphine gas.

Pure phosphine gas is practically insoluble in water and oils and is stable at normal fumigation temperatures. However, it may react with certain metals and cause corrosion, especially at higher temperatures and relative humidities. Metals such as copper, brass and other copper alloys and precious metals, such as gold and silver are susceptible to corrosion by phosphine. Thus, small electric motors, smoke detectors, brass sprinkler heads, batteries, battery chargers, fork lifts, temperature monitoring devices, computers, calculators and other electrical equipment should be protected or removed before fumigation.

RESTRICTED USE PESTICIDE

DUE TO ACUTE INHALATION TOXICITY OF HIGHLY TOXIC PHOSPHINE GAS

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

BAGS
QUIK-FUME

Aluminum Phosphide Fumigant

A fumigant for use against listed insects which infest listed raw agricultural commodities, specified processed foods and animal feeds.

Active ingredient: Aluminum Phosphide 60.0%
Inert ingredients 40.0%

PRECAUCION AL USUARIO: Si usted no lee ingles no use este producto hasta que la etiqueta se le haya sido explicado ampliamente



KEEP OUT OF REACH OF CHILDREN

DANGER / PELIGRO - POISON



STATEMENT OF PRACTICAL TREATMENT

SYMPTOMS of overexposure to phosphine are headache, dizziness, nausea, difficult breathing, vomiting and diarrhea. In all cases of overexposure, get immediate medical attention. Take the victim to a doctor or emergency treatment facility. If the gas from aluminum phosphide is **INHALED**: Move exposed person to fresh air. Keep person warm and make sure person can breathe freely. If breathing has stopped, give artificial respiration by mouth-to-mouth or other means of resuscitation. Do not give anything by mouth to an unconscious person. If aluminum phosphide powder is **SWALLOWED**: Drink or administer one or two glasses of water and induce vomiting by touching back of throat with finger, or if available, syrup of ipecac. Do not give anything by mouth if victim is unconscious or not alert. If aluminum phosphide powder gets on **SKIN**: Brush material off clothes and shoes in a well ventilated area. Allow clothes to aerate in a ventilated area prior to laundering. Wash contaminated bare skin thoroughly, with soap and water. If in **EYES**: Flush with plenty of water. Get medical attention immediately.

SEE SIDE PANELS FOR ADDITIONAL PRECAUTIONARY STATEMENTS

CONTENTS: 6 BAGS (34 grams each) NET WEIGHT: 204 Grams (7.2 oz.)

Manufactured for: **INVENTA CORPORATION**

990 Highland Drive, Suite 110-M, Solana Beach, California 92075, USA
E.P.A. Registration No. 59209-3, E.P.A. Establishment No. 41876-IV-1

DIRECT

"It is a violation of federal law to use this

The Applicator's manual for Quik-Fume Tablets and Bags.

STORAGE

Store in a dry, well ventilated area away from water. Do not contaminate water, food or feed with these commodities. Do not

Do not contaminate water, food or feed

Unreacted or partially reacted aluminum of excess pesticides or rinsate is a violation of by use according to label instructions, agency or the hazardous waste representative guidance. For specific instructions, refer to manual.

Some local and state waste disposal recommendations. Disposal procedures ensure compliance with local regulatory control agency or the hazardous waste representative guidance.

Dispose of empty cans in a sanitary land

If properly exposed, the spent residual phosphide will be grayish-white and color. However, residual dust from incomplete care.

Bags containing spent aluminum phosphide landfill, incinerator or other approved site or local authorities.

For complete disposal, spill and leak procedures. Tablets, Pellets and Bags.

ACCEPTED
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RESTRICTED USE PESTICIDE

DUE TO ACUTE INHALATION TOXICITY OF HIGHLY TOXIC PHOSPHINE GAS
For retail sale to and use only by certified applicators for those uses covered by the applicator's certification or persons trained in accordance with the applicator's manual working under the direct supervision and in the physical presence of the certified applicator. Physical presence means on site or on premises. Read and follow the label and the applicator's manual which contains complete instructions for safe use of this pesticide.

APPLICATOR'S MANUAL

for

QUIK-FUME

Tablets, Pellets and Bags

Aluminum Phosphide Fumigant

A fumigant for use against listed insects which infest listed raw agricultural commodities, specified processed foods and animal feeds

Active ingredient: Aluminum Phosphide 60.0%
Inert Ingredients 40.0%

PRECAUTION AL USUARIO: Si usted no lee ingles no use este producto hasta que la etiqueta se le haya sido explicado ampliamente.

KEEP OUT OF REACH OF CHILDREN
DANGER/PELIGRO-POISON

PRACTICAL TREATMENT STATEMENT

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

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

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

If powder, granules, tablets or pellets of aluminum phosphide get on **SKIN:** Brush material off clothes and shoes in a well ventilated area. Allow clothes to aerate in a ventilated area prior to laundering. Wash contaminated bare skin thoroughly with soap and water.

If in **EYES:** Flush with plenty of water. Get medical attention immediately.

Manufactured for **INVENTA CORPORATION**
990 Highland Drive, Suite 110-M, Solana Beach, California 92075 USA
Phone (619) 792 5665 Fax (619) 792 8578
EPA Registration Nos. 59209-1, 59209-2 and 59209-3

ACCEPTED
WITH COMMENTS
in EPA Letter Dated

SEP 29 1998

Under the Federal Insecticide, Fungicide, and Rodenticide Act
this label for the pesticide
is approved under EPA Reg. No. 59209-1, 2, 3

THIS PRODUCT IS ACCOMPANIED BY AN APPROVED LABEL AND APPLICATOR'S MANUAL. READ AND UNDERSTAND THE ENTIRE LABELING AND MANUAL. ALL PARTS OF THE LABELING AND MANUAL ARE EQUALLY IMPORTANT. FOR SAFE AND EFFECTIVE USE OF THIS PRODUCT CONTACT

INVENTA CORPORATION
990 Highland Drive, Suite 110-M
Solana Beach, California 92075 USA

IF YOU HAVE ANY QUESTIONS REGARDING THIS LABELING OR MANUAL OR DO NOT UNDERSTAND ANY PART OF THIS LABELING OR MANUAL, REFER TO THE APPLICATOR'S MANUAL FOR DETAILED PRECAUTIONS, RECOMMENDATIONS, AND DIRECTIONS FOR USE.

STATEMENT OF WARRANTY

Manufacturer 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. Seller makes no other warranty, either expressed or implied, and buyer assumes all risk should the product be used contrary to label instructions.

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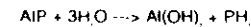
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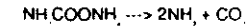
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SECTION 1 INTRODUCTION

Quik-Fume fumigants are used to protect stored commodities from damage by insects and for control of burrowing pests. Fumigation of stored products with Quik-Fume in the manner prescribed in the labeling does not contaminate the stored commodity. Quik-Fume and other aluminum phosphide fumigants are acted upon by atmospheric moisture to produce phosphine (PH₃, hydrogen phosphide) gas. Quik-Fume Tablets, Pellets and Bags contain aluminum phosphide (AIP) as their active ingredient and will liberate phosphine via the following chemical reaction:



Phosphine gas is highly toxic to insects, burrowing pests, humans and other forms of animal life. In addition to its toxic properties, this 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 in this manual. Quik-Fume Tablets & Pellets also contains ammonium carbamate which liberates ammonia and carbon dioxide as follows:



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

Quik-Fume is prepared in three forms, tablets, pellets and bags. The rounded tablets weigh approximately 3 grams and release 1 gram of phosphine gas. They are about 16.5 mm in diameter and are bulk packaged in resealable aluminum flasks containing 100 or 500 tablets each. The pellets weigh approximately 0.6 gram and release 0.2 gram of phosphine gas. They are about 9.5 mm in diameter and are packaged in resealable flasks containing about 1660 or 2500 pellets. The bags contain 34 grams each and release 11 grams of phosphine gas. They are packaged in metal containers of six, ten or one hundred bags to the container. Other package sizes may be available. The bags are packaged in an inert environment.

Upon exposure to air, Quik-Fume Tablets, Pellets and 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. Quik-Fume Tablets and Pellets react somewhat faster than do the bags. The rates of decomposition of the tablets, pellets and bags vary, depending upon the moisture and temperature conditions. For example, when moisture and temperature of the fumigated commodity are high, decomposition of Quik-Fume may be complete in less than 3 days. However, at lower ambient temperatures and low relative humidity levels, decomposition of Quik-Fume may require 5 days or more. After decomposition, Quik-Fume leaves a gray-white powder composed almost entirely of aluminum hydroxide and other approved inert ingredients. If properly exposed, the spent Quik-Fume will normally contain only a small amount of unreacted aluminum phosphide and may be disposed of without hazard. Partially spent residue from incompletely exposed Quik-Fume will require special care. Precautions and instructions for further deactivation and disposal will be given later in the applicator's manual.

Quik-Fume Pellets, Tablets and Bags are supplied in gastight containers and their shelf life is unlimited as long as the packaging remains intact. Once opened for fumigation, the flasks of tablets and pellets may be tightly resealed and stored for future use. The Quik-Fume Bag's container cannot be resealed for future use. Storage and handling instructions will be given in detail later in the applicator's manual.

SAFETY RECOMMENDATION SUMMARY

1. Carefully read the labeling and follow instructions.
2. Never fumigate alone from inside the storage structure
3. Person supervising must be a certified fumigator, and the personnel assisting must be trained in the use of aluminum phosphide. Never allow untrained personnel to handle aluminum phosphide
4. Approved respiratory protection must be available for the fumigation of structures from within.
5. Wear dry gloves of cotton or other materials if contact with Quik-Fume Tablets, Pellets or the powder from Bags is likely. Aerate used gloves and other contaminated clothing in a well ventilated area prior to laundering. Wash hands thoroughly after using Quik-Fume.
6. Open fumigant container in open air only. Never open in a flammable atmosphere.
7. Do not allow Quik-Fume to contact water or pile up.
8. Dispose of empty containers and spent residual dust in a manner consistent with the label instructions.
9. Post warning placards on fumigated areas.
10. Prior to fumigation, notify appropriate company employees. Provide to local officials (fire department, rescue squad, police, etc.) on an annual basis, relevant safety information for use in the event of an emergency.
11. Phosphine fumigants are not to be used for vacuum fumigations.
12. Exposure to phosphine must not exceed the eight hour TWA of 0.3 ppm during application or a ceiling concentration of 0.3 ppm after application is completed.
13. Fumigated areas must be aerated to 0.3 ppm phosphine or less prior to reentry by unprotected workers.
14. Finished foods and feeds that have been fumigated with Quik-Fume must be aerated for 48 hours prior to offering to the end use consumer
15. Transfer of a treated commodity to another site without complete aeration is permissible provided that the new storage site is placarded if the phosphine concentration is above 0.3 ppm.
16. Keep containers of Quik-Fume tightly closed except while removing product for application
17. Protect materials containing metals such as copper, silver, gold and their alloys and salts from corrosive exposure to phosphine
18. Tablets, Pellets and Bags must not come in contact with any processed food, except that tablets and pellets may be added directly to processed brewers rice, malt and corn grits used in the manufacture of beer

19. Do not use aluminum phosphide containers for any purpose other than recycling or reconditioning
20. OSHA recommends pre-exposure screening of employees to detect impaired pulmonary function. They recommend that any employee developing this condition be referred for medical examination

SECTION 2 PRECAUTIONARY STATEMENTS

A. HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER: Aluminum phosphide powder, granules, tablets or pellets may be fatal if swallowed. Do not get in eyes, on skin or on clothing. Do not eat, drink or smoke while handling aluminum phosphide fumigants. If a sealed container is opened or if the material comes into contact with moisture, water or acids, extremely toxic phosphine gas will be released. If a garlic odor is detected, refer to APPLICATOR AND WORKER EXPOSURE section of the applicator's manual for appropriate monitoring procedures. Pure phosphine gas is odorless; the odor is due to a contaminant. Since an odor may not be detected under certain circumstances, the absence of a garlic odor does not mean that phosphine gas is absent. Observe proper application, aeration, reentry and disposal procedures specified elsewhere in the labeling and in this manual to prevent overexposure.

B. PRACTICAL TREATMENT STATEMENT

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

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

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

If powder, granules, tablets or pellets of aluminum phosphide get on **SKIN:** Brush material off clothes and shoes in a well ventilated area. Allow clothes to aerate in a ventilated area prior to laundering. Wash contaminated bare skin thoroughly with soap and water

If in **EYES:** Flush with plenty of water. Get medical attention immediately

C. NOTE TO PHYSICIAN (We recommend that this section be given to the attending physician):

Aluminum phosphide granules, powder, tablets or pellets react with moisture in the air, acids, and many other liquids to release phosphine gas. Mild exposure by inhalation causes malaise, ringing of ears, fatigue, nausea and pressure in the chest which is relieved by removal to fresh air

Moderate poisoning causes weakness, vomiting, epigastric pain, chest pain, diarrhea and dyspnea

Severe poisoning may occur in a few hours to several days, resulting in pulmonary edema and may lead to dizziness, cyanosis, unconsciousness and death

In sufficient quantity, phosphine affects the liver, kidneys, lungs, nervous system and circulatory system. Inhalation can cause lung edema and hyperemia, small perivascular brain hemorrhages, and brain edema. Ingestion can cause lung and brain symptoms, but damage to the viscera 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; and (3) kidney hematuria and anuria. Pathology is characteristic of hypoxia. Frequent exposure over a period of days or weeks may cause poisoning. Treatment is symptomatic. For further information, contact the national poison control center.

D. PHYSICAL AND CHEMICAL HAZARDS

Aluminum phosphide in tablets, pellets, bags and partially spent dust will release phosphine gas if exposed to moisture from the air or if it comes into contact with water, acids and many other liquids. Piling of tablets, pellets or dust from their fragmentation may cause a temperature increase and confine the release of gas so that ignition could occur.

Hydrogen phosphide (phosphine) 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 buildup of hydrogen phosphide to exceed explosive concentrations. Do not confine spent or partially spent dust from metal phosphide fumigants as the slow release of hydrogen phosphide from this material may result in formation of an explosive atmosphere.

Always open containers of aluminum phosphide products outdoors or indoors in the presence of mechanical ventilation that vents immediately outside, as under certain conditions, they may flash upon opening. When opening, point the container away from the face and body and slowly loosen the cap. Although the chances for flash are very remote, never open the container in a flammable atmosphere. *These precautions will also reduce the applicator's exposure to phosphine gas.*

Pure phosphine gas is practically insoluble in water and oils and is stable at normal fumigation temperatures. However, it may react with certain metals and cause corrosion, especially at higher temperatures and relative humidities. Metals such as copper, brass and other copper alloys, and precious metals such as gold and silver are susceptible to corrosion by phosphine. Thus, small electric motors, smoke detectors, brass sprinkler heads, batteries and battery chargers, fork lifts, temperature monitoring systems, electrical switch gear, communication devices, computers, calculators and other electrical equipment should be protected or removed before fumigation.

Phosphine gas will also react with certain metallic salts and therefore, sensitive items such as photographic film, some inorganic pigments, etc should not be exposed

SECTION 3 DIRECTIONS FOR USE

A GENERAL

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

- 1 Quik-Fume Tablets, Pellets and Bags are RESTRICTED USE PESTICIDES due to the acute inhalation toxicity of phosphine gas. These products are for retail sale to and use only by certified applicators for uses covered by the applicator's certification or persons trained in accordance with the manual, working under the direct supervision and in the physical presence of the applicator. Physical presence means on site or on the premises. Read and follow the label and the manual which contains complete instructions for the safe use of this pesticide.
- 2 Quik-Fume is a highly hazardous material and should be used only by individuals trained in its proper use. Before using, read and follow the precautions and directions contained in the Quik-Fume label and in the applicator's manual.

Persons working with Quik-Fume should be knowledgeable of the hazards of this chemical and trained in the use of required respiratory equipment and detector device, emergency procedures and use of the fumigant.

Additional copies of the applicator's manual are available from:

INVENTA CORPORATION
990 Highland Drive, Suite 110-M
Solana Beach, California 92075 USA

- 3 At least two persons trained in the use of aluminum phosphide must be present during fumigation of a structure if entry into the structure is required for application of the fumigant. Two trained persons must also be present during reentry into fumigated or partially aerated structures. Only one trained person is required to be present when Quik-Fume is applied from outside the area to be treated.
- 4 Ship holds, barges, containers on ships, railroad cars and containers shipped piggy-back by railway may be fumigated in transit. However, trucks, vans, trailers and similar transport vehicles cannot be moved over public roads and highways until they are aerated and the warning placards removed.
- 5 Do not fumigate commodities with Quik-Fume when commodity temperature or the temperature to which aluminum phosphide is exposed is below 40°F (5°C).
- 6 The site to be fumigated must first be inspected to determine if it can be made sufficiently gastight. 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.
- 7 Wear dry gloves of cotton or other material while handling Quik-Fume Tablets or Pellets. Wash hands thoroughly after use.
- 8 Phosphine gas may flash at concentrations above its flammable limit. Therefore, always open Quik-Fume containers in open air and never in a flammable atmosphere. This

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precaution will not only prevent harm in the unlikely event of a flash but will reduce the applicator's exposure to phosphine gas

- 9 Piling of tablets, pellets or bags or addition of water to Quik-Fume may speed up the reaction, cause a temperature increase and/or confine the gas so that ignition could occur
- 10 As much as is possible, protect unused Quik-Fume from excessive exposure to atmospheric moisture during application and tightly reseal the aluminum flask prior to returning tablets or pellets to storage. Quik-Fume Bag containers, once opened, cannot be resealed for future use
- 11 Phosphine gas may react with certain metals and their salts to produce corrosion. Copper, copper alloys and precious metals such as silver and gold are susceptible to corrosion and items containing these elements should be removed or protected prior to fumigation with Quik-Fume.
- 12 Do not allow Quik-Fume or its residual dust to come in contact with processed foods or commodity packages intended for retailers except that Quik-Fume Tablets, Pellets or Bags may be added directly to processed brewers rice, malt and corn grits used in the manufacture of beer.
- 13 Respiratory protection approved for the concentration to which the fumigator will be exposed must be available if Quik-Fume is to be applied from within the structure to be fumigated. Respiratory protection need not be available for uses such as outdoor application or addition of tablets or pellets to automatic dispensing devices etc., if exposure above the TLV's will not be encountered. A NIOSH/MSHA approved, full-face gas mask, phosphine canister combination may be used at levels up to 15 ppm. Above this level or in situations where the phosphine concentration is unknown a NIOSH/MSHA approved, self-contained breathing apparatus (SCBA) or its equivalent must be used.
- 14 Notify appropriate company employees prior to fumigation. Provide to local officials (fire department, rescue squad, police, etc.) on annual basis relevant safety information for use in the event of an emergency.

B. EFFICACY

Quik-Fume has been found effective against the following insects and their preadult stages (eggs, larvae and pupae):

• almond moth	• European grain moth	• Mediterranean flour moth	
• angoumois grain moth	• flat grain beetle	• pink bollworm	
• bean weevil	• fruit flies	• raisin moth	•••••
• bees	• granary weevil	• red flour beetle	•••••
• cadelle	• greater wax moth	• rice weevil	•••••
• cereal leaf beetle	• hairy fungus beetle	• rusty grain beetle	•••••
• cigarette beetle	• Hessian fly	• saw-toothed grain beetle	
• confused flour beetle	• Indian meal moth	• spider beetle	
• dermestid beetle	• khapra beetle	• tobacco moth	•••••
• dried fruit beetle	• lesser grain borer	• yellow meal worm	•••••
• dried fruit moth	• maize weevil		•••••

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

C. EXPOSURE CONDITIONS

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

Minimum Exposure Periods for Quik-Fume

Temperature to which Fumigant or Insects are Exposed	Pellets	Tablets	Bags
below 40°F (5°C)	Do not fumigate	Do not fumigate	Do not fumigate
40°-53°F (5-12°C)	8 days (192 hours)	10 days (240 hours)	14 days (336 hours)
54°-59°F (12-15°C)	4 days (96 hours)	5 days (120 hours)	9 days (216 hours)
60°-68°F (16-20°C)	3 days (72 hours)	4 days (96 hours)	6 days (144 hours)
above 68°F (20°C)	2 days (48 hours)	3 days (72 hours)	4 days (96 hours)
above 77°F (25°C)	—	—	3 days (72 hours)

The length of the fumigation must be great enough to provide for adequate control of the insect pests which infest the commodity being treated. Additionally, the fumigation period should be long enough to allow for more or less complete reaction of Quik-Fume with moisture so that little or no unreacted aluminum phosphide remains. This will minimize phosphine exposure during further storage and/or processing of the treated bulk commodity as well as reduce hazards in the disposal of partially spent aluminum phosphide products remaining after space fumigations. The proper length of the fumigation period will vary with exposure conditions, since in general, insects are more difficult to control at lower temperatures and the rate of phosphine gas production by Quik-Fume is less 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. 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 mass, for example by surface application or shallow probing. This is particularly important in the fumigation of a bulk commodity contained in large storages. Exposure times need not be lengthened if phosphine is being re-circulated in bulk storage.

Remember, exposure periods in the table are minimum periods and may not be adequate to control all stored product pests under all conditions nor will they always provide for total reaction of Quik-Fume, particularly if temperature and commodity moisture levels or humidity are low during the fumigation. A temperature of 70°F and 11.5% grain moisture (60% relative humidity) provides excellent conditions for fumigation. At lower humidities the listed exposure period must be increased.

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D. COMMODITIES WHICH MAY BE FUMIGATED WITH QUIK-FUME

Quik-Fume may be used for the fumigation of the listed raw agricultural commodities, animal feed and feed ingredients, processed foods, tobacco and certain other nonfood items.

1. Raw Agricultural Commodities, Animal Feed and Feed Ingredients

The listed commodities may be fumigated with Quik-Fume. Quik-Fume Tablets, Pellets and Bags may be added directly to animal feed, feed ingredients and raw agricultural commodities. For space fumigations Quik-Fume Tablets & Pellets may also be applied in moisture permeable envelopes or on trays or similar devices.

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

2. Processed Foods

The listed processed foods may be fumigated with Quik-Fume. Under no conditions shall any processed food come in contact with Quik-Fume Tablets, Pellets, Bags or residual dust except that Quik-Fume may be added directly to processed brewer's rice, malt and corn grits for use in the manufacture of beer.

- 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 by-products
- 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 milk powder, 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, fliberts, peanuts, pecans, pistachio nuts and walnuts)
- Processed oats (including oatmeal)
- Rice (brewer's rice, grits, enriched and polished rice and wild rice)
- Soybean flour and milled fractions
- Processed tea
- Yeast (including primary yeast)

3. Nonfood Commodities, including Tobacco

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

- * Processed or unprocessed cotton, wool and other natural fibers or cloth
- * Clothing
- * Straw and hay
- * Feathers
- * Human hair, rubberized hair, vulcanized hair, and mohair
- * Leather products, animal hides and furs
- * Tobacco
- * Wood, cut trees, wood chips, and wood and bamboo products
- * Paper and paper products
- * Dried plants and flowers
- * Seeds (including but not limited to grain seed, grass seed, ornamental herbaceous plant seeds and vegetable seed)

E. RECOMMENDED DOSAGES

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 Quik-Fume is required to treat a 30,000 bushel silo whether it is empty or full of grain, unless the surface of the commodity is sealed off by a tarpaulin. The following dosage ranges are recommended for bulk and space fumigations:

Dosage Guidelines For Fumigation With Quik-Fume

Product	per 1000 cu. ft.*	per 1000 bu.*
Bags	2 - 13	2 - 16
Pellets	100 - 725	120 - 900
Tablets	20 - 145	25 - 180

*Dosage range for dates, nuts and dried fruits is 20 - 40 tablets, 100 - 200 pellets, 2 - 4 bags/1000 cu. ft.; 25 - 50 tablets, 125 - 250 pellets, 2-6 bags/1000 bu.

These dosages are not to be exceeded. It is important to be aware that a shortened exposure period cannot be fully compensated for with an increased dosage of phosphine. The wide range of dosages listed above is required to handle the variety of fumigation situations encountered in practice. Somewhat higher dosages are usually recommended under cooler, drier conditions or where exposure periods are relatively short. However, the major factor in selection of dosage is the ability of the structure to hold phosphine gas during the fumigation. A good illustration of this point is a comparison of the low dosages required to treat modern, well-sealed warehouses with the higher dosage used for poorly constructed buildings that cannot be sealed adequately. In certain other fumigations, proper distribution of lethal concentrations of gas becomes a very important factor in dose selection. An example where this may occur is in the treatment of grain stored in flat storage. Poor gas distribution frequently results when the fumigant cannot be uniformly added to the grain, and it must be treated by surface application.

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

Recommended Quik-Fume Dosages for Various Types of Fumigations

Type of Fumigation	Bags	Pellets	Tablets
1 Space			
Mills, warehouses etc.	2-6/1000 cu.ft	100-300/1000 cu.ft.	20-60/1000 cu.ft.
Bagged commodities	3-6/1000 cu.ft	150-300/1000 cu.ft.	30-60/1000 cu.ft.
Processed fruits & nuts	2-4/1000 cu.ft	100-200/1000 cu.ft.	20-40/1000 cu.ft.
Stored Tobacco	2-4/1000 cu.ft	100-200/1000 cu.ft.	20-40/1000 cu.ft.
2 Bulk Stored Commodities			
Vertical storage	3-6/1000 cu.ft. 4-7/1000 bu	150-300/1000 cu.ft. 200-375/1000 bu	30-60/1000 cu.ft. 40-75/1000 bu.
Tanks	4-7/1000 cu.ft. 5-8/1000 bu.	150-350/1000 cu.ft. 200-450/1000 bu.	30-70/1000 cu.ft. 40-90/1000 bu.
Flat storages	5-13/1000 cu.ft. 6-16/1000 bu.	250-725/1000 cu.ft. 300-900/1000 bu.	50-145/1000 cu.ft. 60-180/1000 bu.
Farm bins	6-13/1000 cu.ft. 8-16/1000 bu.	350-725/1000 cu.ft. 450-900/1000 bu.	70-145/1000 cu.ft. 90-180/1000 bu.
Bunker & tarped ground storages	3-6/1000 cu.ft. 4-8/1000 bu.	150-400/1000 cu.ft. 200-500/1000 bu.	30-80/1000 cu.ft. 40-100/1000 bu.
Railcars	3-6/1000 cu.ft. 4-7/1000 bu.	150-325/1000 cu.ft. 200-400/1000 bu.	30-65/1000 cu.ft. 40-80/1000 bu.
Barges	3-7/1000 cu.ft. 4-9/1000 bu.	150-400/1000 cu.ft. 200-500/1000 bu.	30-80/1000 cu.ft. 40-100/1000 bu.
Ship holds	3-6/1000 cu.ft. 4-7/1000 bu.	150-330/1000 cu.ft. 200-375/1000 bu.	30-66/1000 cu.ft. 40-75/1000 bu.

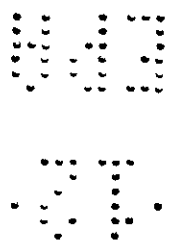
Higher dosages are recommended in structures that are loose construction and in the fumigation of bulk stored commodities in which diffusion will be slowed and result in poor distribution of phosphine gas.

F. APPLICATION PROCEDURES

1. General Statement

Regardless of the type of storage 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:

- a A plan should be devised for application, aeration and disposal of the fumigant to keep at a minimum any exposure to phosphine. See the requirements in the APPLICATOR AND WORKER EXPOSURE section of the applicator's manual.
- b Quik-Fume Tablets, Pellets or Bags should be applied to provide effective gas concentrations throughout the storage. When Quik-Fume is not applied uniformly to a bulk commodity (surface application in a flat storage or ship hold for example) exposure times should be lengthened to allow for penetration of gas throughout the storage.
- c The storage structure should be sealed to maintain a suitable gas concentration over the time period required for control of insect pests.



- d Ideally, exposure periods should be long enough to provide for adequate control of insect pests and also more or less completely react the fumigant.
- e Piling of tablets, pellets or bags whether applied to a bulk commodity or for space fumigation may prevent complete breakdown of the product by limiting its access to moist air. This can result in decreased efficacy as a result of poor gas release and may leave an active residue for disposal which contains considerable amounts of unreacted aluminum phosphide. Piling of product may also result in increased hazard of fire particularly if contacted by water.
- f Contact with water should be carefully avoided when applying Quik-Fume for treatment of bulk commodities or space.
- g Aluminum phosphide fumigants should not be applied to confined spaces where the concentration of phosphine may build up to exceed its lower flammable limit.
- h Observe the precautionary and safety statements mentioned in the applicator's manual.

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

2. Fumigations of Farm Bins

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

All vents and aeration ducts must be tightly sealed using 4 mil polyethylene sheeting or its equivalent. The plastic must be sealed directly to the metal with tape or other adhesive. It is not sufficient to "cinch up" the plastic as with a belt. The surface of the grain may be covered with plastic sheeting after Quik-Fume has been applied. Tarping of the grain surface will greatly reduce leakage. Other sealing techniques are recommended, i.e. closure of all large cracks with caulking, foam insulation or other sealant. Sealing these cracks will greatly reduce the required dosage. Two mil or thicker plastic can be used for tarping the grain surface; however, the plastic used on the outside of the bin should be at least 4 mils. When an entire structure is tarped, the plastic must be at least 6 mils thick to prevent excessive tearing during the fumigation.

Probing tablets or pellets into the grain mass is a recommended method of application. Probe insertions should be scattered evenly over the surface. A rigid pipe, about 5 to 7 feet long and 1 1/2 inch diameter can be used. In this event, use about 20-50 tablets or 100-250 pellets per probe. The fumigant is gradually released into the probe as it is withdrawn from the grain. Releasing all the fumigant into the probe at once may retard the production of hydrogen phosphide and might cause an ignition of gas trapped in the clump of tablets or pellets. The uniform spreading of a large portion of the fumigant in floor level aeration ducts in combination with tarping the grain surface is a preferred method of treatment. Be sure the inside of the aeration duct is dry before adding the fumigant. This method should not be used if it is likely or suspected that the grain immediately surrounding the aeration duct is "caked" or otherwise in such a condition as to hinder phosphine penetration into the grain mass. Addition of Quik Fume to water in an aeration duct can cause a fire. Seal the aeration fan as described above.

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

If monitoring equipment is not available, an approved canister respirator must be worn for indoor application. If an approved respirator is not available, application must be done from outside of the site to be fumigated. Also refer to all other precautions given in this manual.

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

3. Fumigation of Flat Storages

- a. Establish a plan for application of fumigant to the structure. Treatment of these types of storages may require considerable effort; therefore, sufficient manpower should be available to complete the work rapidly enough to prevent excessive exposure to phosphine gas. Vent flasks outside the storage, conduct fumigations during the cooler periods of the day, and employ other work practices to minimize exposures. It is advisable to wear respiratory protection during application of fumigant to flat storages. Refer to the sections on APPLICATOR AND WORKER EXPOSURE AND RESPIRATORY PROTECTION in the applicator's manual.
- b. Seal any vents, cracks and other sources of leaks.
- c. Apply tablets or pellets by surface application, shallow probing, deep probing or uniform addition as the bin is filled. Bags are usually surface applied unless equipped for shallow probing.

Storages requiring more than 24 hours to fill should not be treated by addition of fumigant to the commodity stream as large quantities of phosphine may escape before the bin is completely sealed. Probes should be inserted vertically at intervals along the length and width of the flat storage. Tablets or pellets may be dropped into the probe at intervals as it is withdrawn.

Surface application may be used if the bin can be made sufficiently gastight to contain the fumigant long enough for it to penetrate the commodity. In this instance, it is advisable to place about 25 per cent or more of the dosage in the floor level aeration ducts. Check the ducts prior to addition of Quik-Fume to make sure that they contain no water. For bins that are difficult to adequately seal, it may be desirable to uniformly spread a larger percentage of the dosage in the aeration ducts. Refer to instructions given in the farm bin section above.

- d. Tarping the surface of the commodity is often advisable, particularly if the overhead section of the storage cannot be well sealed.
- e. Lock all entrances to the storage and post fumigation warning placards.

4. Fumigation of Vertical Storage (Concrete Upright Bins And Other Silos In Which Commodities Can Be Rapidly Transferred)

- a. Close all openings and seal all cracks to make the structure as airtight as possible. Prior to the fumigation, seal the vents near the bin top which connects to adjacent bins.
- b. Tablets or pellets may be applied continuously by hand or by an automatic dispenser on the headhouse/gallery belt or the fill opening as the commodity is loaded into the bin.

- c. Seal the bin deck openings after the fumigation has been completed.
- d. Bins requiring more than 24 hours to fill should not be fumigated by continuous addition into the commodity stream. These bins must be fumigated by probing, surface application, re-circulation or a combination of these methods. Exposure periods should be lengthened to allow for diffusion of gas to all parts of the bins if Quik-Fume has not been applied uniformly throughout the commodity mass. Shallow probing and surface application should only be used as a last resort and only in bins that can be sealed virtually gas tight. Long exposure periods are required to assure complete penetration of the gas.
- e. Place warning placards on the discharge gate and on all entrances.

5. Recirculation of Phosphine in Bulk Storage

It is permissible and sometimes desirable to recirculate 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 duct work. This method facilitates the quick and uniform penetration of phosphine throughout the commodity. In some instances a reduced dosage may be used.

6. Fumigation of Mills, Food Processing Plants and Warehouses

- a. Using the label, calculate the length of the fumigation and dosage of tablets, pellets or bags to be applied based upon volume of the building, air and/or commodity temperature and the general tightness of the structure.
- b. Carefully seal and placard the space to be fumigated.
- c. Place trays or sheets of paper or foil on the floor throughout the structure to hold Quik-Fume Pellets or Tablets. Bags can be placed directly on the floor.
- d. Spread Quik-Fume on the sheets at a density no greater than 30 tablets or 150 pellets per sq. ft. This corresponds to approx. 1/4th's flask of tablets or 1/2th's flask of 2500 pellets or slightly more than one flask of 1660 pellets per 3'X4' area.
- e. Check to see that Quik-Fume has not piled up and that it is spread evenly to minimize contact between the individual tablets, pellets, and bags.
- f. Doors leading to the fumigated space should be closed, sealed, locked, and placarded with warning signs.
- g. The fumigation period usually lasts from 3 to 7 days, depending upon the temperature and humidity. Upon completion of the exposure period, windows, doors, vents, etc. should be opened and the fumigated structure allowed to aerate for at least two hours before entering. Remote monitoring is recommended prior to entering. When required, gas concentration readings may be taken using low level detector tubes or similar devices to ensure safety of personnel who reenter the treated area. Refer to the APPLICATOR AND WORKER EXPOSURE section in the applicator's manual.

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- h. Collect the spent bags and Quik-Fume dust, and dispose of them, with or without further deactivation. Follow the recommendations given under DISPOSAL INSTRUCTIONS in this manual.

- i. Remove fumigation warning placards from the aerated structure.

7. Fumigation of Rail Cars, Containers, Trucks, Vans and Other Transport Vehicles

a. General Information

Rail cars, containers, trucks, vans and other transport vehicles loaded with bulk raw agricultural commodities or other commodities approved for direct addition are treated in essentially the same way as any other flat storage facility. The dose may be scattered over the surface after loading has been completed or may be probed below the surface. Bags are usually applied in vehicles on the boards or discs described below.

Carefully seal any vents, cracks, or other leaks. Remember, rail cars and containers shipped piggyback by rail may be fumigated in transit, but it is not legal to move trucks, trailers, vans etc. over public roads or highways until they are aerated. See PLACARDING OF FUMIGATED AREAS in the applicator's manual.

The shipper must provide advance notification to the consignee that treated commodities will be shipped. Proper handling of the rail cars at their destination is the responsibility of the consignee. The consignee must be familiar with the physical, chemical and toxicological properties of hydrogen phosphide (phosphine), worker exposure limits and symptoms and first aid treatment for hydrogen phosphide poisoning and must be knowledgeable in making gas concentration measurements. Unless prior arrangements have been made to return the rail cars containing the spent fumigant back to the shipper, consignees must also know proper procedures for deactivation and disposal of spent fumigant. Un-aerated rail cars being returned in this manner must bear fumigation warning placards and be carefully sealed. It is the consignee's responsibility to aerate the car unless prior arrangements have been made to return the un-aerated car directly to the shipper. Consignees must also ensure that industrial hygiene exposure limits are not exceeded and that the storage for the treated commodity is placarded if the airspace in and/or around the commodity contains more than 0.3 ppm hydrogen phosphide.

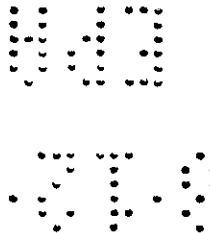
Quik-Fume Bags are suited to fumigation of packaged commodities or bulk processed foods. They shall not be placed in or attached directly to commodity packages containing processed food. If placement of bags on the floor of a boxcar is not convenient, or if the vehicle is being fumigated in transit, they may be attached to a wall or other support. They may also be applied by taping the bags on cardboard with spacing between bags. Tape across the bag ends only. Specially designed discs or boards are also available for this purpose.

If these boards or discs are used, taping the bags is not necessary.

Instructions that follow suggest specific procedures for treatment of rail cars and containers when direct addition to the commodity is not used.

b. Procedures for Hopper Rail Cars — Round Hatch

- 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 to the extent possible.
- 4. Open cans, and insert bags into the pockets or tape the bags on the disc. Bags must not be folded.
- 5. Place the loaded disc into position, bag side up.
- 6. Secure the disc into place with tape.
- 7. Cover the hatch opening with "poly" sheeting before closing the cover.
- 8. Lower the cover into place and secure. Insert a "DANGER" placard into a clear plastic bag, and glue or otherwise affix it to the hatch cover.
- 9. Insert "DANGER" placards into clear plastic bags, and secure with glue, or otherwise affix near the ladder on each side of the car. Pre-glued, press on envelopes are available for this purpose.

c. Procedures for Hopper Rail Cars — Slot Hatch

- 1. Fold the edges of a board to form a tray. The board is designed to "hang" in the hatch opening.
- 2. Open containers, and insert bags into pockets of the board. Bags must not be folded.
- 3. Place the loaded board into position, bag side up.
- 4. Secure into place with tape.
- 5. Cover the entire hatch opening with "poly" sheeting.
- 6. Lower the hatch covers.
- 7. Insert a "DANGER" placard into a clear plastic bag, and glue or otherwise affix it securely to the hatch cover.
- 8. Insert "DANGER" placards into a clear plastic bags and secure with glue, or otherwise affix them near the ladder on each side of the car. Pre-glued, press on envelopes are available for this purpose.

d. Procedures for Box Cars

- 1. Close and secure one of the doors. Seal all openings and joints. If needed, caulk joints, and drape entire doorway with "poly" film, securing the edges to the inner wall, floor and ceiling with tape or suitable adhesive.
- 2. Inspect the roof, floor and walls for holes and/or cracks. Seal all openings with either tape or caulking compound.
- 3. If needed, 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 "poly", it may not be necessary to seal the door from the outside. If doorway is not draped, seal all cracks, openings and leaky joints with masking tape and/or caulking compound from the outside.

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cars are received may be closed on more than one side and the distinction between an indoor and outdoor operation is not clear cut. Worker exposure monitoring should be performed initially in these situations where exposure may be excessive.

3 Responsibilities of Consignees

Unless prior arrangements have been made to return un-aerated rail cars containing the spent fumigant back to the shipper, the consignee receiving the fumigated rail car must:

- a aerate the rail cars and verify that it contains 0.3 ppm PH₃ (phosphine) or less.
- b remove the fumigation warning placards from the rail car, and
- c Remove and dispose of the fumigant, unless pellets or tablets have been added directly to the commodity.

The consignee must also:

- d ensure that the post-application worker exposure limit is not exceeded.
- e transfer the fumigated commodity from the rail car, with or without prior aeration; and
- f placard the new storage if it contains more than 0.3 ppm PH₃ in or above the commodity mass.

4. Terpalutin and Bunker Fumigations.

Use of plastic sheeting or tarpaulins to cover commodities is one of the easiest means for providing relatively gastight enclosures which are very well suited for fumigation. Polyethylene tarps are penetrated only very slowly by phosphine gas, and light coverings are readily formed from the sheets. These enclosures may vary widely from a tarpaulin placed over a small stack of bagged commodity containing a few cubic feet to a plastic covered bunker storage capable of holding 600,000 bushels of grain or more.

An enclosure suitable for fumigation may be formed by covering bulk or packaged commodity with polyethylene sheeting. The sheets may be taped together to provide a sufficient width of material to ensure that adequate sealing is obtained. If the flooring upon which the commodity rests is of wood or other porous material, it should be repositioned onto a tarpaulin prior to covering for fumigation. The plastic covering of the pile may be sealed to the floor using sand or water snakes or 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 to reduce the risk of tearing. Thinner polyethylene sheeting, about 2 mils, is suitable for most indoor tarp fumigations and for sealing windows, doors and other openings in structures. However, 4 mil, or thicker "poly" is more suitable for outdoor applications where wind or other mechanical stresses are likely to be encountered.

Tablets, pellets or bags may be applied to the tarped stack or bunker storage of bulk commodity through slits in the polyethylene covering. Probing or other means of dosing may be used. Avoid application of large amounts of Quik-Fume at any one point. The Quik-Fume should be added below the surface of the bulk commodity if condensation or other source of moisture is likely to form beneath the "poly". The slits in the covering should be carefully taped to prevent loss of gas once the dose has been applied. Quik-Fume flags are recommended for the treatment of bagged commodities and processed foods, although pellets and tablets on trays or sheets of paper may be used. Care should

- 1 Open cans and insert bags into pockets of disc or board, or use tape to secure the bags
- 5 Place the loaded disc or board onto the load, bag side up. Secure it into place with tape
- 6 Or nail it to the wall
- 7 Post "DANGER" placards by inserting into clear plastic bags and gluing or otherwise affixing them to each door. Pre-glued envelopes are available for this purpose

e. Procedures for Containers

Procedures for containers are essentially the same as box cars, except their doors tend to be more gas tight and they often have only a rear door which must be sealed after application is completed. If a refrigeration unit is present, it must be sealed from inside protecting it from phosphine damage

Procedures for Receivers of Fumigated Rail Cars

1. General

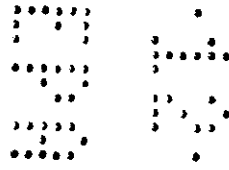
Persons responsible for receiving rail cars which have been fumigated in transit must be familiar with the pertinent regulations, hazards, safety considerations, aeration and disposal procedures, etc. which apply to practices and situations enumerated in performing this function.

The appropriate sections of this applicator's manual should be reviewed as part of the training program for persons involved in receiving fumigated rail cars. These persons should be knowledgeable in the following areas:

- a health hazards and symptoms of overexposure
- b practical treatment for overexposed persons
- c physical and chemical hazards
- d worker exposure limits
- e techniques and requirements for monitoring
- f odor of phosphine
- g respiratory protection and protective clothing
- h aeration and disposal
- i placarding

2. Worker Exposure, Crew Size, Respiratory Protection

When receiving rail cars in outdoor locations, certain safety procedures are not required, i.e. monitoring outdoors for worker exposure a minimum crew size of 2 and the availability of respiratory equipment. However, in no case may the post application worker be exposed to over 0.3 ppm as a ceiling concentration. Some facilities where



be taken to ensure that the polyethylene sheeting is not allowed to cover the Quik-Fume confining the gas, thus preventing contact with moist air.

Distribution of phosphine gas is generally not a problem in the treatment of bagged commodities and packaged processed foods. However, fumigation of larger bunker storages containing bulk commodity will require proper application procedures to obtain adequate results.

See appropriate precautions if the fumigation is conducted indoors as opposed to outdoors. Indoor fumigation precautions are handled as any other situation where the application is made from outside the area being fumigated. Workers may occupy adjacent indoor areas, but they must be protected from overexposure to hydrogen phosphide by adequate sealing, phosphine monitoring, ventilation or as a last resort, respiratory equipment.

Do not walk on stacks during the fumigation.

Place "Danger" placards at conspicuous locations on the tarped stack or bunker only.

If concentrations in excess of 0.3 ppm are observed in adjacent indoor areas, the areas must be evacuated of unprotected workers and posted with "Danger" signs until this adjacent area is aerated to 0.3 ppm or below.

5. Fumigation of Ships

a. General Information

1. **IMPORTANT** — shipboard, in-transit ship holds fumigation is also governed by U.S. Coast Guard Regulation 46 CFR 147A. Refer to this regulation prior to fumigation.
2. The Fumigation Handbook of the U.S. Department of Agriculture, Federal Grain Inspection Service (FGIS) contains additional procedures which must be followed if infested bulk grain is to be fumigated to avoid the designation "infested" by the FGIS, or to obtain a USDA phytosanitary inspection certification. This Fumigation Handbook may also be followed voluntarily.

b. Pre-voyage Fumigation Procedures

1. Prior to fumigating a vessel for in-transit cargo fumigation, the master of the vessel or his representative and the fumigator must determine whether the vessel is suitably designed and configured 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 safe occupancy by the ship's crew throughout the duration of the fumigation, then the vessel will not be fumigated unless all crew members are removed from the vessel. The crew members will not be allowed to reoccupy the vessel until the vessel has been properly aerated and a determination has been made by the master of the vessel and the fumigator that the vessel is safe for reoccupancy.
2. The person responsible for the fumigation must notify the master of the vessel or his representative of the requirements relating to personal protection equipment and detection equipment. 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. An SCBA or its

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equivalent must be used above 15 ppm or at unknown concentrations. A person qualified in the use of this equipment must accompany the vessel with the 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.

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 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 gasket materials.
4. Placard all entrances to the treated spaces with fumigation warning signs.
5. If the fumigation is not completed and the vessel aerated before the manned vessel leaves port, the person in charge of the vessel shall ensure that at least two units of personal protection equipment and one gas or vapor detection device, and a person qualified in their operation be on board the vessel during the voyage.
6. During the fumigation or until the manned vessel leaves port or the cargo is aerated, the person in charge of the fumigation shall ensure that a qualified person using gas or vapor detection equipment tests spaces adjacent to areas containing fumigated cargo and all regularly occupied spaces for fumigant leakage. If leakage of the fumigant is detected, the person in charge of the fumigation shall take action to correct the leakage or shall inform the master of the vessel or his representative of the leakage so that corrective action can be taken.
7. Review with the master or his representative, the precautions and procedures for the voyage.

c. Application Procedures for Bulk Dry Cargo Vessels and Tankers

1. Apply tablets, pellets or bags by scattering uniformly over the commodity surface. Product may be shallow or deep probed into the commodity mass. Recirculation systems may be used to aid the penetration of phosphine throughout the commodity.
2. Immediately after the application of the fumigant, close and secure all hatch covers, tank tops, butterworth valves, manways, etc.

d. In Transit Fumigation of Containers Aboard Ships

In transit fumigation of containers on ships is also governed by the U.S. Department of Transportation Regulation 49 CFR 176.76.

Application procedures for fumigation of raw commodities or processed foods in containers and other transport vehicles are described in the DIRECTIONS FOR USE section of the applicator's manual.

e. 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

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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 reoccupied.

2. Do not enter fumigated areas except under emergency conditions. If necessary to enter the 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.

f. 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 fumigation concentrations are at safe levels, as indicated by a suitable detector.
2. It is the responsibility of the consignee to see that the spent fumigant is disposed of properly and that industrial hygiene exposure limits are not exceeded during unloading of the ship or during subsequent transfer and storage of the treated commodity. Safety, aeration and disposal requirements in the United States are given herein as a guide. Consult regulations in the receiving country for local requirements.

g. Personal Protective Equipment and Monitoring

1. Fully loaded holds on dry bulk carriers are considered an outdoor fumigation, and therefore monitoring and respiratory protection are not required during application.
2. NIOSH/MSHA approved respiratory protection must be available at the site in case it is needed during application to tanker holds and in partially filled holds if the hold must be entered for fumigant application. This respiratory protection must consist of a full face gas mask - phosphine canister combination or self-contained breathing apparatus (SCBA) or its equivalent. If an SCBA or its equivalent is not available at the application site, it must be available locally, for example, at a fire station or rescue squad.
3. If hydrogen phosphide is detected leaking into crew's quarters, housing or work areas, a minimum of two qualified persons on ship should wear the gas mask and canister described above while aerating the area and locating and sealing the leak.
4. Refer to the following sections 4 through 11 for additional required and recommended practices.

6. Fumigation of Barges

Barge fumigations are also regulated by U.S. Coast Guard regulation 46 CFR 147A as modified by U.S. Coast Guard Special Permit 2-75. This permit must be obtained prior to the fumigation and is available from U.S. Coast Guard, Hazardous Branch, MTH-1, 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 Quik-Fume and seal if necessary. Notify consignee if the barge is to be fumigated in transit.

The consignee has the same responsibilities concerning aeration, monitoring, knowledge and disposal as does the rail car receiver.

7. Fumigations in Small Sealable Enclosures.

Excellent results may be attained in the treatment of small enclosures since it is often possible to control the fumigation and also to make the enclosure virtually gastight. Take care not to overdose, during these fumigations. A single pellet will treat a space of 1.4 to 10 cubic feet. From 6.9 to 50 cubic feet may be fumigated with a single Quik-Fume Tablet. A single bag will treat 77 to 500 cubic feet.

8. Treatment of Beehives, Supers And Other Beekeeping Equipment.

Quik-Fume Tablets, Pellets, and Bags may be used for the control of the greater wax moth in stored beehives, supers and other beekeeping equipment and for the destruction of bees, Africanized bees, and diseased bees including those infested with tracheal mites and foulbrood. The recommended dosage for this use is 30-45 tablets, 150-225 pellets or 3 or 4 bags per 1000 cu.ft. Fumigations may be performed in chambers at atmospheric pressure, under tarpaulins, etc. by using bags or placing tablets or pellets on trays or in moisture permeable envelopes. Do not add more than 2 tablets or 10 pellets to trays or in moisture permeable envelopes. Do not add more than 2 tablets or 10 pellets to each envelope. Honey from treated hives or supers may only be used for bee food.

9. Burrowing Pest Control

a. List of Burrowing Pests.

Quik-Fume Tablets and Pellets may be used out of doors only for the control of the following burrowing rodents and moles: woodchucks and yellow-belly marmots (rockchucks), prairie dogs (except Utah prairie dogs), Norway and roof rats, mice, ground squirrels, moles, voles, gophers and chipmunks.

b. Directions for Use

Add from 1 to 4 tablets or 5 to 20 pellets to each burrow opening. Then seal tightly by shoveling soil over the entrance. Place the tablets or pellets far enough down the burrow that the soil used to plug the burrow doesn't cover the tablets or pellets, slowing down their action. Where possible, subsurface tunnels or runways should be treated every 5 to 10 feet with a dose of 2 to 4 tablets or 10 to 20 pellets. Use lower rates in smaller burrows, in tight soils, under moist soil conditions and higher rates in larger burrows, in porous soils when soil moisture is low. In extremely dry or porous soil, it is sometimes not possible to obtain satisfactory results. This is particularly true in instances where the burrow systems are extensive such as moles or gophers. It is always better not to fumigate during extended periods of dry weather. Addition of several cups of water to the burrow prior to dosing with Quik-Fume may improve efficacy in some porous soils. Treat reopened burrows and fresh runways a second time 1 to 3 days after the initial treatment. Quik-Fume may be used out of doors only for control of burrowing pests. Do not use within 15 feet (5 meters) of inhabited structures. Do not apply to burrows which may open under or into occupied buildings. For use on all agricultural and noncropland areas.

c. Environmental Hazards

This product is very highly toxic to wildlife. Non-target organisms exposed to phosphine gas in burrows will be killed. Do not apply directly to water or wetlands (swamps, bogs,

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marshes, and patholes.) Do not contaminate water by cleaning of equipment or disposal of wastes

d Endangered Species Restrictions

The use of any pesticide in a manner that may kill or otherwise harm an endangered or threatened species or adversely modify their habitat is a violation of federal law. The use of this product is controlled to prevent death or harm to endangered or threatened species that occur in the following counties or elsewhere in their range

STATE (REGIONAL U.S. FISH AND WILDLIFE OFFICE)

* SPECIES-COUNTY

ARIZONA (Albuquerque, NM)

* Black-footed Ferret - Statewide

CALIFORNIA (Portland, OR)

* San Joaquin Kit Fox-Fresno, Kern, Kings, Merced, Monterey, San Benito, San Luis Obispo, Santa Barbara, Tulare, Ventura

* Blunt-nosed Leopard Lizard-Fresno, Kern, Kings, Madera, Merced, Tulare

COLORADO (Denver, CO)

* Black-footed Ferret - Statewide

FLORIDA (Atlanta, GA)

* Eastern Indigo Snake - Statewide

GEORGIA (Atlanta, GA)

* Eastern Indigo Snake - Statewide

KANSAS (Denver, CO)

* Black-footed Ferret - Statewide

MONTANA (Denver, CO)

* Black-footed Ferret - Statewide

NEBRASKA (Denver, CO)

* Black-footed Ferret - Statewide

NEW MEXICO (Albuquerque, NM)

* Black-footed Ferret - Statewide

NORTH DAKOTA (Denver, CO)

* Black-footed Ferret - Statewide

OKLAHOMA (Albuquerque, NM)

* Black-footed Ferret - Statewide

SOUTH DAKOTA (Denver, CO)

* Black-footed Ferret - Statewide

TEXAS (Albuquerque, NM)

* Black-footed Ferret - Statewide

UTAH (Denver, CO)

* Desert Tortoise-Washington

* Black-footed Ferret - Statewide

WYOMING (Denver, CO)

* Black-footed Ferret - Statewide

Use of this product in the above areas is prohibited without first contacting and obtaining permission from the endangered species specialist in the regional offices of the U.S. Fish and Wildlife Service (FWS) nearest you

e Special Local Restrictions

1. North Carolina - Quik-Fume Tablets and Pellets may only be used for control of rats and mice in the state of North Carolina. Use against other pests is not permitted.

2. Oklahoma - A special permit for black-tailed prairie dog control by poisoning is required in Oklahoma. Contact the Oklahoma State Department of Wildlife Conservation to obtain this permit.
3. Wisconsin - A state permit is required for use of pesticides to control small mammals, except rats and mice. Contact your local Department of Natural Resources for information.
4. Indiana - Use of Quik-Fume Tablets and Pellets for mole control is not legal in the State of Indiana.
5. Missouri - A state permit is required for use of pesticides in Missouri to control small mammals, except rats and mice. Contact the Missouri Department of Conservation for information.
6. Kansas - A special permit for black-tailed prairie dog control by poisoning is required in Kansas. Contact the Kansas Dept. of Wildlife and Parks for information.
7. California - Use of Quik-Fume Tablets and Pellets for chipmunk control is not legal in the State of California.

SECTION 4

AERATION OF FUMIGATED COMMODITIES

A. Foods and Feeds

Tolerances for phosphine residues have been established at 0.1 ppm for animal feeds and 0.01 ppm for finished foods. To assure compliance with these tolerances, it is necessary to aerate these commodities for 48 hours prior to offering to the end use consumer.

B. 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.

C. Alternatives

As an alternative to these aeration periods, each container of a treated commodity may be analyzed for residues using accepted analytical methods. If residues are less than tolerance levels, the commodity may be shipped to the consumer regardless of the above holding periods.

SECTION 5

PLACARDING OF FUMIGATED AREAS

The applicator must placard or post all entrances to the fumigated area with signs bearing

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

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2. The statement "Area and/or commodity under fumigation. DO NOT ENTER. NO ENTREE"
3. The statement "This sign may only be removed after the commodity is completely aerated (contains 0.3 ppm or less phosphine gas). If incompletely aerated commodity is transferred to a new site, the new site must also be placarded, and workers must not be exposed to more than 0.3 ppm phosphine."
4. The date and time fumigation begins and is completed.
5. Name of fumigant used.
6. Name, address and telephone number of the applicator.

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

Do not remove a placard until the treated commodity is completely aerated. To determine whether aeration is complete, each fumigated site or vehicle must be monitored and shown to contain 0.3 ppm or less phosphine gas in the air space around and when feasible, in the mass of the commodity. If 0.3 ppm or less phosphine is detected, the placard may be removed. However, if more than 0.3 ppm is detected, the placard must be transferred with the commodity to the new site. Workers who transfer or handle incompletely aerated commodity must be informed and appropriate measures must be taken (i.e. ventilation or respiratory protection) to prevent exposures from exceeding 0.3 ppm phosphine. It is recommended that the person removing the placard be knowledgeable in the physical, chemical and toxicological properties of phosphine; how to take gas readings; the exposure limits for phosphine; and symptoms of and first aid treatment for poisoning.

SECTION 6 PROTECTIVE CLOTHING

Wear dry gloves made of cotton or other material if contact with tablets, pellets, or their dust is likely. Wash hands after use. It is not necessary to wear gloves when handling bags.

SECTION 7 RESPIRATORY PROTECTION

A. WHEN RESPIRATORY PROTECTION MUST BE WORN

NIOSH/MSHA approved respiratory protection must be worn during exposure to concentrations in excess of permitted limits or when concentrations are unknown.

B. 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 to escape from levels up to 1500 ppm. Above this level or in situations where the phosphine concentration is unknown, a NIOSH/MSHA approved, self-contained breathing apparatus (SCBA) or its equivalent must be used. The NIOSH/MSHA Pocket Guide 8-85, DHEW/NIOSH 78-210, lists these and other types of approved respiratory and their concentration limits at which they may be used.

C. REQUIREMENTS FOR AVAILABILITY OF RESPIRATORY PROTECTION

Respiratory protection must be available at the site of application in case it is needed when applying Quik-Fume from within the structure being fumigated. An approved full face gas mask - phosphine canister combination or self-contained breathing apparatus (SCBA) or its equivalent must be available at the site of application. If an SCBA or its equivalent is not available at the application site, it must be available locally, for example, at a fire station or rescue squad.

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

Respiratory protection need not be available for outdoor applications.

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

SECTION 8 GAS DETECTION EQUIPMENT

There are several reliable devices marketed. One type is the hand pump when used in conjunction with the appropriate detector tube. They are portable, simple devices and do not require intensive training or elaborate supporting equipment to operate. Furthermore, they are inexpensively adaptable to remote monitoring procedures and will measure concentrations of hydrogen phosphide in air in trace amounts on up. Use instructions are enclosed with each purchase.

Consult your local supplier of such equipment or contact your Quik-Fume distributor for more information.

SECTION 9 APPLICATOR AND WORKER EXPOSURE

A. HYDROGEN PHOSPHIDE EXPOSURE LIMITS

Exposure to hydrogen phosphide must not exceed the 8 hour TWA of 0.3 ppm for applicators and workers during application. Application is defined as the time period covering the opening of the first container, applying the appropriate dosage of fumigant and closing up the site to be fumigated. All persons in the treated site and in adjacent indoor areas are covered by this exposure standard.

After application is completed worker or applicator exposure must not exceed 0.3 ppm maximum concentration. Such exposures may occur because of leakage into enclosed areas from fumigation sites during reentry or during transfer of unaerated commodity.

B. APPLICATION OF FUMIGANT

Depending upon temperature and humidity Quik-Fume releases hydrogen phosphide (phosphine) gas slowly upon exposure to moisture from the air. This release is

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sometimes slow enough to permit applicators to deposit fumigant in the desired areas and then vacate the premises without significant exposure to the gas. If the fumigator's exposure exceeds the 8 hour TWA of 0.3 ppm, approved respiratory protection must be worn. Gas concentration measurements for safety purposes must be made using low level detector tubes or other suitable low level detection equipment. See the "Industrial Hygiene Monitoring" section below.

It is often practical to wear respiratory protection from start to finish. This is particularly true when performing large space fumigations or when fumigating bulk stored commodities in flat storage buildings.

C. LEAKAGE FROM FUMIGATED SITES

Hydrogen phosphide is highly mobile and given enough time may penetrate seemingly gastight materials such as concrete and cinder block. Therefore, adjacent enclosed areas likely to be occupied should be examined to ensure that significant leakage has not occurred. Sealing of the fumigated site and/or air flow in the occupied areas should be used to reduce exposure.

D. AERATION AND REENTRY

If the area is to be entered after fumigation, it must be aerated until the level of hydrogen phosphide gas is 0.3 ppm or below. The area or site must be monitored to ensure that liberation of gas from the treated commodity does not result in the development of unacceptable levels of hydrogen phosphide. Do not allow reentry into treated areas by any person before this time unless protected by an approved respirator.

E. HANDLING UNAERATED COMMODITIES

Transfer and processing of a treated commodity prior to complete aeration is permissible; however, workers must not be exposed to hydrogen phosphide in excess of the permitted exposure limit.

F. INDUSTRIAL HYGIENE MONITORING

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

G. ENGINEERING CONTROLS AND WORK PRACTICES

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

SECTION 10 STORAGE AND DISPOSAL

A. STORAGE

Containers should be stored in a dry, well ventilated area, away from heat and 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. Do not store in buildings where humans or domestic animals reside. Keep out of reach of children.

Quik-Fume Tablets and Pellets are supplied in resealable, aluminum flasks. Do not expose the product inside flasks to atmospheric moisture any longer than is necessary. Seal tightly before returning opened flasks to storage.

Tablet and pellet flasks should not be stored at sub-zero temperatures because this will increase the possibility of an ignition (flash) when opened.

The shelf life of Quik-Fume is virtually unlimited if the containers are tightly sealed.

B. DISPOSAL OF UNREACTED OR PARTIALLY REACTED QUIK-FUME

(From spills, leaking containers or other sources) : Unreacted or partially reacted aluminum phosphide is acutely hazardous. Improper disposal of these products is a violation of federal law. If these products 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.

FOR SPECIFIC INSTRUCTIONS CONCERNING SPILLS AND LEAKS, REFER TO SECTION 11

C. DISPOSAL OF QUIK-FUME FOLLOWING A SPACE FUMIGATION

1. General

If properly exposed, the residual dust remaining after a fumigation will be a grayish white, spent, nonhazardous waste and will contain only a small amount of unreacted aluminum phosphide. However, residual dust from incompletely exposed aluminum phosphide (See "Exposure Guide" on page 7 of this manual) will require special care. Confinement of partially spent aluminum phosphide as in a closed container or collection and storage of large quantities of the dust may result in a fire hazard. Small amounts of hydrogen phosphide may be given off from the partially reacted aluminum phosphide and confinement of the gas may result in a flash.

2. Deactivation and Disposal of Quik-Fume Tablets and Pellets.

a. General

Unless it can be determined with certainty that the tablets or pellets are spent, they must be held for several days beyond the required exposure time prior to disposal, or the wet method of deactivation must be used. If the dust retains any of its greenish color, the wet method is recommended. Extension of the

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

b. Dry Method

In open areas, small amounts (up to 5 flasks) of residual dust may be disposed of on site by burial or by spreading over the land surface away from inhabited buildings. Up to 3 flasks of this residual dust (4 to 7 lbs.) may be collected in a one gallon bucket for holding or disposal. Larger amounts of residual dust may be collected in a porous cloth bag (burlap, cotton, etc.) for holding and/or transportation to a suitable disposal site. Do not put more than one half case (7 flasks of tablets or 7 flasks of pellets) of residual dust in each bag. Always transport these bags in an open vehicle. CAUTION: Do not use this method for dust that still retains some of its original greenish color. Never confine, dispose of or store residual dust in closed containers such as dumpsters, drums or plastic bags.

Spent residual dust from pellets or tablets may 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.

c. Wet Method

Fill an appropriate sized metal container 2/3 full with water. For each gallon of water add 1/4 cup of low sudsing detergent or surfactant. Use no less than 10 gallons of water/detergent solution for each case of spent material. Slowly pour the dust into the container as the water is stirred. Wear appropriate respiratory protection. DO NOT COVER THE CONTAINER AT ANY TIME. IF THE CONTAINER IS COVERED, THE PHOSPHINE BEING GENERATED WILL BE CONFINED AND MAY DECOMPOSE EXPLOSIVELY. This must be done outdoors or in front of an adequate fan that exhausts immediately outside.

Dispose of the water/dust mixture (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. The water from the slurry may be evaporated prior to disposal. After being held for 36 hours, it may be poured into a sanitary sewer if approved by local authorities.

d. Disposal of Empty Flasks

Method One: Triple rinse flasks and stoppers with water. Then offer for recycling or reconditioning, or puncture and dispose of them in a sanitary landfill or other approved site or by other procedures approved by state and local authorities. The water from the rinsate may be evaporated prior to disposal. Dispose of rinsate or rinsate residue in a sanitary landfill or by other approved procedures. Small quantities can be poured out on the ground.

After being held for 36 hours the rinsate may be poured into a sanitary sewer if approved by local authorities

Method Two: Remove lids and place empty flasks in a secure location outdoors or in structure being fumigated until residue in flasks is reacted. Puncturing and dispose of them in a sanitary landfill or other approved site or by other procedures approved by state and local authorities

NOTE: It is permissible to tighten lids back in place on the triple rinsed or reacted empty flasks, place them in the original carton and ship them back to the distributor. They are not hazardous waste. Contact your distributor for information and approval.

D DEACTIVATION AND DISPOSAL OF QUIK-FUME BAGS

1 General

Unless it can be determined with certainty that the bags are spent, they must be deactivated as described below prior to disposal.

All the methods below may be used for deactivating used or unused Quik-Fume Bags, regardless of the extent to which the aluminum phosphide has been consumed in the production of hydrogen phosphide.

2. Dry Deactivation

Collect bags, and place them into a secure, ventilated holding container. Store the bags until they are spent. It is recommended that unused or partially spent bags 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. Prior to final disposal, bags may be spread out in a single layer on the ground or concrete and covered with several inches of sand until they are spent. Bags that have not been exposed for the minimum times specified in the exposure guide on page 7 should not be covered with sand. Dry deactivation is the recommended procedure for unused or partially spent bags. If in doubt concerning whether the bags are spent, contact your Quik-Fume distributor.

Ignition can 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 relatively isolated area, protected from rain.

3. Wet Deactivation - Method One

Fill an appropriate sized container with water a few inches from the top. Submerge intact bags for 36 hours. A metal grid works well to keep bags submerged. Do not cover container. Wear appropriate respiratory protection. This must be done outdoors or in front of an adequate fan that exhausts outside. The water may be disposed of in a storm sewer, sanitary sewer or by pouring it out on the ground.

4. Wet Deactivation - Method Two

Fill an appropriate sized metal container 2/3 full with water. For each gallon of water, add 1/4 cup of low sudsing detergent or surfactant. Use no less than 1 gallon of water/detergent solution for 60 bags. Open each bag and dump the contents into the container as the water is stirred. Wear appropriate respiratory protection. DO NOT COVER THE CONTAINER AT ANY TIME. IF THE CONTAINER IS COVERED, THE PHOSPHINE BEING GENERATED WILL BE CONFINED AND MAY DECOMPOSE EXPLOSIVELY. This must be done outdoors or in front of an adequate fan that exhausts immediately outside

5 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

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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 the water/dust mixture (slurry) (with or without preliminary pouring out of excess water) in a sanitary landfill or other suitable burial site approved by local authorities. The water from the slurry may be evaporated prior to disposal. Where permissible, the slurry may be poured out on the ground. After being held for 36 hours it may be poured into a sanitary sewer if approved by local authorities

Never confine partially spent bags or slurry in closed containers such as closed drums or plastic bags.

6. Disposal of Empty Quik-Fume Bag Containers

Dispose of containers in a sanitary landfill or by other approved state or local procedures. They need not be rinsed.

SECTION 11 SPILL AND LEAK PROCEDURES

A. GENERAL

A spill, other than incidental to application or normal handling or punctured containers can produce high levels of gas, and therefore, attending personnel must wear an SCBA or its equivalent when the concentration of hydrogen phosphide gas is unknown. If the concentration is known, other NIOSH/MSHA approved respiratory protection can be worn. Wear dry gloves made of cotton or other material when contact with the powdered formulation, pellets or tablets, is likely.

B. DAMAGE TO FIBERBOARD CASE

Check metal containers. If they are damaged, handle as described below. If they are undamaged return them to cardboard cartons or other suitable packaging which complies with DOT regulations

C. LEAKING PRODUCT CONTAINER PROCEDURES

If containers have been punctured or damaged causing a leak, the product may be immediately used, the containers may be temporarily repaired with aluminum tape, the fumigant may be transferred from the damaged containers to sound metal containers which should be sealed and properly labeled as aluminum phosphide, or it may be deactivated and disposed. See pages 27-30 of this manual for deactivation and disposal procedures. Transport the damaged containers to an area suitable for pesticide storage for inspection. Further instructions and recommendations may be obtained, if required, from your distributor

Handle empty, damaged containers as described in container disposal sections

D. SPILL PROCEDURES

1. General

Do not flush spillage down drain with water. DO NOT use water at anytime to clean up a spill. Water in contact with unreacted aluminum phosphide will rapidly accelerate the production of

hydrogen phosphide gas and could cause spontaneous ignition of the gas. If the spill is only a few minutes old and is not contaminated by other materials, collect the spillage and place it back into the original or other sound metal container and lightly seal. Seal punctures with foil tape. If possible, use immediately. CAUTION: AN IGNITION MAY OCCUR WHEN THESE CONTAINERS ARE REOPENED

2. Quik-Fume Bags

Since the formulation is placed in small, tough bags, a spill will be either bags or a small quantity of powder spilled from a punctured bag. Consequently, spills are not likely to constitute a frequent problem

If the spill is more than a few minutes old or has been contaminated with water, gather it up and place it into an open top can and deactivate it immediately.

If on-site deactivation is not feasible, these open containers should be transported in open vehicles to a suitable area away from occupied buildings. Wet or dry deactivation may then be carried out.

3. QUIK-FUME TABLETS AND PELLETS

If the spilled material is contaminated or has begun to visibly decompose, gather it up and place it into open top, perforated gallon cans and process it immediately.

Do not add more than about one flask (2 to 3 lbs.) of spilled material to the bucket. If on-site deactivation is not feasible, these open containers should be quickly transported in open vehicles to a suitable area away from occupied buildings. Protect from rainfall but do not seal or cover cans. Wet or dry deactivation may then be carried out as described in the section immediately below.

E. DEACTIVATION AND DISPOSAL OF UNREACTED TABLETS, PELLETS AND BAGS

1. Wet Method

Transport material by hand or in open vehicles to open air away from occupied structures. Fill a drum 2/3 full with water.

Add 1/4 cup of low sudsing detergent or surfactant in each gallon of water. Each flask of tablets or pellets or the contents of 45 bags should be mixed with no less than 1 gallon of water/detergent solution. Slowly pour the material into the water as it is stirred. After 5 flasks or the contents of 200 bags have been added to a 55 gallon drum of water, wait until bubbling is very slow before proceeding to add 5 more flasks or 200 bags. Repeat this procedure until the limit is reached. Concentration readings should be taken to ensure that inhalation exposure does not exceed the prescribed limits. Stir occasionally thereafter for at least 36 hours. Wear appropriate respiratory protection. DO NOT COVER THE CONTAINER. IF THE CONTAINER IS COVERED, THE HYDROGEN PHOSPHIDE BEING GENERATED WILL BE CONFINED AND WILL DECOMPOSE EXPLOSIVELY. The wet method of deactivation is the method of choice for quantities in excess of 5 flasks (10 to 15 pounds). It is safe to dispose of this slurry.

Dispose of the resulting deactivated slurry, with or without preliminary pouring out of excess water, at a landfill or other suitable burial site approved by local authorities. The water from the slurry may be evaporated prior to disposal. Where permissible, this slurry may be poured into a sanitary sewer or out onto the ground

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2. Dry Method

See instructions in disposal section above.

NOTE: Never place pellets, tablets, their dust or the dust/water slurry in a confined container such as a closed drum or plastic bags. Any hydrogen phosphide generated will be confined and may decompose explosively.

