

ACCEPTED

NOV 13 1987

Under the Federal Insecticide, Fungicide, and Rodenticide Act, as amended, for the pesticide registered under EPA Reg. No. 2548-67

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DETIAPHOS PELLETT LABEL --- FRONT PANEL

RESTRICTED USE PESTICIDE
DUE TO ACUTE INHALATION TOXICITY OF HIGHLY
TOXIC HYDROGEN PHOSPHIDE (PHOSPHINE, PH3) 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 accompanying product 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 Research Products Company product manual which contains complete instructions for the safe use of this pesticide.

Detiaphos(R) PELLETS

A fumigant for the control of most stored product insects and their pre-adult stages.

Active Ingredient: Magnesium Phosphide.....34%
Inert Ingredients!.....66%
TOTAL.....100%

KEEP OUT OF REACH OF CHILDREN

DANGER/PELIGRO-POISON

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

STATEMENT OF PRACTICAL TREATMENT

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

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

02400
 02450 IF THE PELLETS OR THEIR DUST ARE SWALLOWED: Drink or administer
 02500 one or two glasses of water and induce vomiting by touching back
 02600 of throat with finger, or if available, administer syrup of
 02650 ipecac. Do not give anything by mouth if victim is unconscious
 02700 or not alert.

02750
 02800 IF PELLETS OR THEIR DUST GET ON SKIN OR CLOTHING: Brush or
 02850 shake material off clothes and shoes in well ventilated area.
 02900 Allow clothes to aerate in a ventilated area prior to
 02950 laundering. Do not leave contaminated clothing in occupied
 03000 and/or confined areas such as automobiles, vans, motel rooms,
 03050 homes, etc. Wash contaminated skin thoroughly with soap and
 03100 water.

03150
 03200 IF DUST FROM THE PELLETS GETS IN EYES: Flush with plenty of
 03250 water. Get medical attention.

03300 See side panels for additional precautionary statements.

03400
 03450 Manufactured by: Detia Freyberg, GmbH
 03500 P. O. Box 10
 03550 6947 Lauderbach
 03600 F.R. of Germany

03700
 03750 Distributed by: Research Products Company
 03800 Div. of McShares, Inc.
 03850 P. O. Box 1460
 03900 Salina, KS 67402-1460

04000
 04050 EPA Establishment No. 33982WG01 Net Contents:
 04100 EPA Registration No. 2548-67 Net Weight:

04150
 04200 LEFT PANEL

04250 HAZARDS TO HUMANS AND DOMESTIC ANIMALS

04300
 04350 KEEP OUT OF REACH OF CHILDREN
 04400 DANGER/POISON

04450 Magnesium phosphide in pellets or their dust can be fatal if
 04500 swallowed. Do not get in eyes, in nose, on skin or on clothing.
 04550 Do not eat, drink or smoke while handling magnesium phosphide
 04600 fumigants. When the container is opened Detiaphos(R) Pellets
 04650 will begin to release hydrogen phosphide (phosphine) which is an
 04700 extremely toxic gas. Contact with water, acids and some other
 04750 liquids will accelerate this reaction. If a garlic odor is
 04800 detected, refer to section on "Industrial Hygiene Monitoring" on
 04850 page of the accompanying product manual for appropriate
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monitoring procedures. Pure hydrogen phosphide 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 hydrogen phosphide gas is absent. Observe proper application, aeration, reentry and disposal procedures specified elsewhere in the labeling to prevent overexposure.

FREQUENT EXPOSURE TO LOW CONCENTRATIONS ABOVE PERMISSIBLE LEVELS OVER A PERIOD OF DAYS OR WEEKS MAY CAUSE POISONING.

NOTE TO PHYSICIAN

Magnesium phosphide in pellets or their dust reacts with moisture from the air, water, acids, and many other liquids to release hydrogen phosphide (phosphine) gas. Mild exposure by inhalation causes malaise (indefinite feeling of sickness), ringing of ears, fatigue, nausea and pressure in chest which are relieved by removal to fresh air. Moderate poisoning causes weakness, vomiting, epigastric pain (pain just above the stomach), chest pain, diarrhea and dyspnea (difficulty in breathing). Symptoms of severe poisoning may occur within a few hours or up to several days, resulting in pulmonary edema (fluid in lungs) and may lead to dizziness, cyanosis (blue or purple skin color), unconsciousness and death.

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

RIGHT PANEL

DIRECTIONS FOR USE

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

The booklets "Application Procedures for Dettiaphos(R) Pellets and Dettiaphos(R) Tablets" and "Instructions for Intransit Fumigation of Ship Holds with Dettiaphos(R) Pellets and Tablets" are a part of labeling. Refer to them for application

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07750 procedures and other information necessary to properly use
07800 Deltaphos(R) Pellets.
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07950

08000 THIS PRODUCT IS ACCOMPANIED BY THE LABELING LISTED ABOVE. READ
08050 AND UNDERSTAND THE ENTIRE LABELING. ALL PARTS OF THE LABELING
08100 ARE EQUALLY IMPORTANT FOR SAFE AND EFFECTIVE USE OF THIS
08150 PRODUCT. CALL RESEARCH PRODUCTS COMPANY OR EPA IF YOU HAVE ANY
08200 QUESTIONS OR DO NOT UNDERSTAND ANY PART OF THIS LABELING.
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08300 Refer to product labeling for use restrictions to protect
08350 ENDANGERED SPECIES.
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08500 STORAGE AND DISPOSAL

08550
08600 STORAGE

08650 Flasks should be stored in a dry, well ventilated area, away
08700 from heat and under lock and key. Post as a pesticide storage
08750 area. Do not contaminate water, food or feed by storing
08800 pesticides in the same areas used to store these commodities.
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08950 Do not store in buildings where humans or domestic animals
09000 reside. Refer to the booklet "Application Procedures for
09050 Deltaphos(R) Pellets and Deltaphos(R) Tablets" for additional
09100 storage instructions.
09150

09200 DISPOSAL OF UNREACTED OR PARTIALLY REACTED PELLETS (From spills,
09250 leaking flasks or other sources)
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09350 Unreacted or partially reacted Deltaphos(R) Pellets are acutely
09400 hazardous. Improper disposal of this product is a violation of
09450 federal law.
09500

09550 If this product cannot be disposed of by ordinary use or
09600 according to labeling instructions, contact your state pesticide
09650 or environmental control agency or the hazardous waste
09700 representative at the nearest EPA regional office for guidance.
09750 Do not contaminate water by disposal.
09800

09850 Reacted pellets are not hazardous. For complete disposal, spill
09900 and leak procedures refer to the booklet "Application Procedures
09950 for Deltaphos(R) Pellets and Deltaphos(R) Tablets".
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10050
10100 DISPOSAL OF EMPTY FLASKS

10150 METHOD ONE: Triple rinse flasks and stoppers with water. Then
10200 offer for recycling or reconditioning, or puncture and dispose
10250 of them in a sanitary landfill or other approved site or by
10300 other procedures approved by state and local authorities.
10350 Dispose of rinsate in a sanitary landfill or by other approved
10400

10450 procedures.

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10550 METHOD TWO: Remove lids and place empty flasks outdoors or in
10600 structure being fumigated until residue in flasks is reacted.
10650 Puncture and dispose of them in a sanitary landfill or other
10700 approved site or by other procedures approved by state and local
10750 authorities.
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GENERAL

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Consult federal, state and local disposal authorities for
11050 approved procedures other than those given above. Approved
11100 procedures vary for different types of generators.
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*If in doubt concerning whether the dust is reacted and/or
concerning proper disposal techniques contact Research Products
Company.
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Fungicide, and Rodenticide Act,
as amended, for the pesticide
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EPA Reg. No. 2548-67-68

**RESTRICTED USE PESTICIDE
DUE TO ACUTE INHALATION TOXICITY OF HIGHLY
TOXIC HYDROGEN PHOSPHIDE (PHOSPHINE, PH₃) GAS**

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**APPLICATION PROCEDURES
FOR
Detiaphos(R)**

PELLETS

AND

Detiaphos(R)

TABLETS

**HYDROGEN PHOSPHIDE FUMIGANTS
FOR
USE AGAINST LISTED INSECTS
WHICH INFEST LISTED RAW AGRICULTURAL
COMMODITIES, ANIMAL FEEDS, PROCESSED FOODS,
NONFOOD PRODUCTS AND STORED TOBACCO**

Research Products Company
Div. of McShares, Inc.
P. O. Box 1460
Salina, Kansas 67402-1460

**RECEIVED
EPA**

NOV 1987

EPA Establishment No. 33982WG01
EPA Registration No. 2548-67
EPA Registration No. 2548-68

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00099 F I. INTRODUCTION

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A. HISTORY

The history of Detia(R) metal phosphide pesticides is long, dating back to the mid-1930's. In 1970 Detia(R) GAS EX-B was introduced into the United States. Detiaphos(R), which has recently been introduced into the U.S.A., contains magnesium phosphide as the active ingredient. The manufacturer, Detia Freyberg GMBH, West Germany was the early pioneer in the development of hydrogen phosphide as a fumigant gas.

B. PRODUCT DESCRIPTION

Both Detiaphos(R) Pellets and Detiaphos(R) Tablets are a mixture of magnesium phosphide (34% by weight), ammonium carbamate and other inertis which are pressed into tablet and/or pellet form. The nearly spherical pellets are about 3/8" in diameter and weigh 0.6 grams each. The tablets are either disc shaped (4/5" in diameter and 1/5" thick) or spherical in shape (5/8" in diameter) and weigh 3.0 grams each. A pellet will produce about 0.1 gram hydrogen phosphide, the tablet about 0.5 gram. Both react with atmospheric moisture to produce hydrogen phosphide (PH₃) in the following way:



Warm, humid air accelerates the reaction while cool, dry air has the opposite effect.

Detia Freyberg also manufactures aluminum phosphide based fumigants which release hydrogen phosphide in a similar manner. Magnesium phosphide is much more reactive than aluminum phosphide and under similar temperature and humidity conditions during exposure will liberate hydrogen phosphide more rapidly than will aluminum phosphide.

Detiaphos(R) Pellets and Tablets also contain 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.

Spent Detiaphos(R) is a gray-white powder composed almost entirely of magnesium hydroxide and other approved inert ingredients. If properly exposed, the spent Detiaphos(R) will normally contain only a small amount of unreacted magnesium phosphide and may be disposed of without hazard.

It is not considered a hazardous waste. However, the partially spent residue from incompletely exposed Detiaphos(R)

00153 requires special care. Precautions and instructions for
00154 further deactivation and disposal will be given later in
00155 this manual.
00156

00157 C. PRODUCT PACKAGING

00158 The tablets are packaged 500 to a flask. The pellets are
00159 packaged 1660 to a flask.
00160

00161 The aluminum flasks in which they are packaged are
00162 resealable and seamless. Their shelf life is almost
00163 unlimited as long as the packaging remains well sealed and
00165 intact. Once opened, the flasks may be tightly resealed and
00166 stored for future use.
00167

00168 D. WHAT IS HYDROGEN PHOSPHIDE?

00169 Hydrogen phosphide, more commonly referred to as phosphine,
00170 is a colorless gas which is toxic to insects, humans, and
00171 other forms of animal life. It is very mobile with a high
00172 vapor pressure. Thus, the penetrating capability of hydrogen
00173 phosphide is great. The combination of high molecular
00174 activity, vapor pressure and toxicity at low dosages
00175 accounts for its wide acceptance as a fumigant.
00176

00177 E. SAFETY RECOMMENDATIONS

- 00178 1. Carefully read the labeling and follow instructions
00179 explicitly.
- 00180 2. Never work alone when applying fumigant from within the
00181 storage structure.
- 00182 3. Never allow uninstructed persons to handle Detiaphos(R).
- 00183 4. Approved respiratory protection must be available
00184 for the fumigation of structures from within.
- 00185 5. Wear dry gloves made of cotton or other material when
00186 contact with tablets, pellets or their dust is likely.
- 00187 6. It is preferable to open fumigant containers in open air
00188 or near a fan that exhausts outside immediately. Never
00189 open in a flammable atmosphere.
- 00190 7. Do not allow Detiaphos(R) to contact liquid water or to
00191 pile up.
- 00192 8. Dispose of empty containers and spent residual dust in a
00193 proper manner consistent with the label instructions.
- 00194 9. Post "DANGER" signs on fumigated areas.
- 00195 10. Notify appropriate company employees, and provide
00196 relevant safety information to local officials annually
00197 for use in the event of an emergency.
- 00198 U 11. Hydrogen phosphide fumigants are not to be used for vacuum
00200 fumigations.
- 00201 12. Exposure to hydrogen phosphide must not exceed the
00202 8 hour TWA of 0.3 ppm during application or a maximum
00203 concentration of 0.3 ppm after application is completed.
00204 This includes reentry into a structure.
- 00205 13. Fumigated finished foods and feeds must be aerated
00206 48 hours prior to offering to the end consumer.
00207 U 14. Transfer of a treated commodity to another site without
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- 00209 complete aeration (down to 0.3 ppm maximum) is
- 00210 permissible provided the new site is placarded.
- 00211 15. Aerate contaminated clothing in well ventilated area
- 00212 prior to washing.
- 00213 16. Keep containers tightly closed except when removing
- 00214 product.
- 00215 17. Do not reuse magnesium phosphide containers for any
- 00216 purpose other than recycling or reconditioning.
- 00217 18. OSHA recommends that the exposure screening of
- 00218 employees be conducted to detect impaired pulmonary
- 00219 function. OSHA recommends that any employees developing
- 00221 the above condition be referred for medical attention.
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- 00223
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II. PRECAUTIONARY STATEMENTS

A. HAZARDS TO HUMANS AND DOMESTIC ANIMALS

Keep Out of Reach of Children
 DANGER-POISON

Magnesium phosphide in pellets, tablets or their dust can be fatal if swallowed. Do not get in eyes, in nose, on skin or on clothing. Do not eat, drink or smoke while handling magnesium phosphide fumigants. When the container is opened, Deltaphos(R) Tablets or Pellets will begin to release hydrogen phosphide (phosphine) which is an extremely toxic gas. Contact with water, acids and some other liquids will accelerate this reaction. If a garlic odor is detected, refer to section on "Industrial Hygiene Monitoring" on page for appropriate monitoring procedures. Pure hydrogen phosphide 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 hydrogen phosphide gas is absent. Observe proper application, aeration, reentry and disposal procedures specified elsewhere in the labeling to prevent overexposure.

FREQUENT EXPOSURE TO CONCENTRATIONS ABOVE PERMISSIBLE LEVELS OVER A PERIOD OF DAYS OR WEEKS MAY CAUSE POISONING.

B. STATEMENT OF PRACTICAL TREATMENT

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

- 1. If gas or dust from tablets or pellets is inhaled: Get exposed person to fresh air. Keep warm and make sure person can breathe freely. If breathing has stopped, give artificial respiration by mouth-to-mouth or other

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- 00264 means of resuscitation. Do not give anything by mouth
00265 to an unconscious person.
00266
- 00268 U 2. If the pellets, tablets or their dust are swallowed:
00269 Drink or administer one or two glasses of water and induce
00270 vomiting by touching back of throat with finger, or if
00271 available, administer syrup of Ipecac. Do not give
00272 anything by mouth if victim is unconscious or not alert.
00273
- 00275 U 3. If pellets, tablets or their dust gets on skin or
00276 U clothing: Brush or shake material off clothes and shoes in
00277 well ventilated area. Allow clothes to aerate in a ventilated
00280 area prior to laundering. Do not leave contaminated
00281 clothing in occupied and/or confined area such as
00282 automobiles, vans, motel rooms, homes, etc. Wash
(0283 contaminated skin thoroughly with soap and water.
00284
- 00285 U 4. If dust from the pellets or tablets gets in eyes:---
00287 Flush with plenty of water. Get medical attention.
00288
- 00289 C. NOTE TO PHYSICIAN
00290 Magnesium phosphide tablets, pellets or their dust reacts
00291 with moisture from the air, water, acids and many other
00292 liquids to release hydrogen phosphide (phosphine) gas. Mild
00293 exposure by inhalation causes malaise (indefinite feeling of
00294 sickness), ringing of ears, fatigue, nausea and pressure in
00295 chest which are relieved by removal to fresh air. Moderate
00296 poisoning causes weakness, vomiting, epigastric pain (pain
00297 just above the stomach), chest pain, diarrhea and dyspnea
00298 (difficulty in breathing). Symptoms of severe poisoning may
00299 occur within a few hours or up to several days, resulting in
00300 pulmonary edema (fluid in lungs) and may lead to dizziness,
(0301 cyanosis (blue or purple skin color), unconsciousness and
00302 death.
00303
- 00304 In sufficient quantity hydrogen phosphide affects the liver,
00305 kidneys, lungs, nervous system, and circulatory system.
00306 Inhalation can cause lung edema (fluid in lungs) and
00307 hyperemia (excess of blood in a body part), small
00308 perivascular brain hemorrhages and brain edema (fluid in
00309 brain). Ingestion can cause lung and brain symptoms, but
00310 damage to the viscera (body cavity organs) is more common.
00311 Hydrogen phosphide poisoning may result in (1) pulmonary
00312 edema, (2) liver elevated serum GOT, LDH and alkaline
00313 phosphatase, reduced prothrombin, hemorrhage and jaundice
00314 (yellow skin color) and (3) kidney hematuria (blood in
00315 urine) and anuria (abnormal or lack of urination).
00316 Pathology is characteristic of hypoxia (oxygen deficiency in
00317 body tissue). Frequent exposure over a period of days or
00318 weeks may cause poisoning. Treatment is symptomatic.
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- 00320 The following measures are suggested for use by the
00321 physician in accordance with his own judgment:

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1. In its milder to moderate forms (symptoms of poisoning may take up to 24 hours to make their appearance), the following is suggested:
 - a. Complete rest 1-2 days during which the patient must be kept quiet and warm.
 - b. If the patient suffers from vomiting or increased blood sugar, appropriate solutions should be administered. Treatment with oxygen is recommended as is the administration of cardiac and circulatory stimulants.

2. In cases of severe poisoning (intensive care unit recommended):

- a. Where pulmonary edema is observed, steroid therapy should be considered and close medical supervision is recommended. Blood transfusions may be necessary.
- b. In case of manifest pulmonary edema, venesection should be performed under vein pressure control. Heart glycosides (I.V.) can be used in case of hemoconcentration. Venesection may result in shock. In the case of progressive edema of the lungs, immediately intubate and remove edema fluid and administer oxygen over-pressure respiration, as well as any measures required for shock treatment. In case of kidney failure, extracorporeal hemodialysis is necessary. There is no specific antidote known for this poisoning.
- c. If pellets or tablets are ingested, induce vomiting. Flush the stomach with a diluted potassium permanganate solution or a solution of magnesium peroxide until flushing liquid ceases to smell of carbide. Thereafter, apply carbomedicinals.

D. PHYSICAL AND CHEMICAL HAZARDS

Magnesium phosphide in tablets, pellets or partially spent dust will release hydrogen phosphide gas if exposed to moisture from the air or if it comes into contact with water, acids or 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. Since magnesium phosphide is so much more reactive than products containing aluminum phosphide, Detiaphos(R) will present more hazard if it is contacted with liquid water, allowed to pile up or is confined so long as to allow the gas concentration to exceed the flammable limit.

00376
 00377 It is preferable to open flasks of Detiaphos(R) Tablets or
 00378 Pellets in open air or near a fan which exhausts outside
 00379 immediately. Never open in a flammable atmosphere because
 00380 on rare occasions they may flash. When opening, point the
 00381 container away from the face and body and slowly loosen the
 00382 cap. These precautions will also reduce the applicator's
 00383 exposure to hydrogen phosphide gas.

00384
 00385 Pure hydrogen phosphide gas is practically insoluble in
 00386 water and oils and is stable at normal fumigation
 00388 temperatures. However, it may react with certain metals and
 00389 cause corrosion, especially at higher temperatures and
 00390 relative humidities. Metals such as copper, brass and other
 00391 copper alloys, and precious metals such as gold and silver
 00392 are susceptible to corrosion by hydrogen phosphide. Thus,
 00393 small electric motors, smoke detectors, brass sprinkler
 00394 heads, batteries and battery chargers, fork lifts,
 00395 temperature monitoring systems, switching gears,
 00396 communication devices, computers, calculators and other
 00397 electronic or electrical equipment should be protected or
 00398 removed before fumigation. In most cases all electronic
 00399 equipment must be removed. Hydrogen phosphide gas will also
 00400 react with certain metallic salts and therefore, sensitive
 00401 items such as photographic film, some inorganic pigments,
 00402 etc., should not be exposed.

00403 00404 00405 00406 III. DIRECTIONS FOR USE

00407 00408 A. GENERAL

- 00409
 00410 1. It is a violation of federal law to use this product in
 00411 a manner inconsistent with its labeling. Detiaphos(R)
 00412 Tablets and Pellets are Restricted Use Pesticides due to
 00413 the acute inhalation toxicity of hydrogen phosphide
 00414 (phosphine, PH₃) gas. For retail sale to and use only
 00415 by certified applicators for those uses covered by the
 00416 applicator's certification or persons trained in
 00417 accordance with this product manual working under the
 00418 direct supervision and in the physical presence of the
 00419 certified applicator. Physical presence means on site
 00420 or on the premises.
- 00421 2. Detiaphos(R) is a highly hazardous material and may be
 00422 used only by individuals trained in its proper use.
 00423 Before using, read and follow the label precautions and
 00424 directions on the label and in labeling.

00425
 00426 Additional copies of this manual are available from:

00427
 00428 Research Products Company
 00429 P. O. Box 1460

Salina, Kansas 67402-1460
913-825-2181

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3. Magnesium phosphide fumigants such as Detiaphos(R) are more reactive than products containing aluminum phosphide as the active ingredient. In general, Detiaphos(R) is intended for use where cooler and/or drier exposure conditions prevail, where aluminum phosphide might not break down properly. It is recommended that Detia(R) aluminum phosphide be used at higher temperatures and humidities.
 4. At least two trained persons must be present when Detiaphos(R) Pellets or Detiaphos(R) Tablets are applied from within the space being treated or during reentry into a fumigated or partially aerated site. Only one trained person is required when the fumigant is applied from outside the area to be treated.
 5. Prior to applying this product, you must inspect the storage structure to determine if it can be made sufficiently gas tight. Decide how personal exposure monitoring should be conducted. Notify appropriate company employees and provide relevant safety information to local officials annually for use in the event of an emergency. Apply this fumigant in an effective and safe manner including emergency procedures, etc.
 6. Ship holds, barges, containers on ships, railroad cars and containers shipped piggyback by rail may be fumigated intransit. However, fumigated trucks, vans, trailers and similar transport vehicles cannot be moved over public roads or highways until they are aerated.
 7. Pellets and/or tablets or their reacted residues must not come into contact with any processed food with the EXCEPTION that both can be added directly to processed brewers rice, malt, and corn grits used in the manufacture of beer.
 8. Protect copper, silver, gold and their alloys from corrosive exposure to hydrogen phosphide.
 9. Do not fumigate commodities with this product when commodity temperature is below 40 degrees F (5 degrees C). The only exception to this rule is cold weather tobacco fumigation. See page _____ of this manual.
- B. EFFICACY
Complete control of listed insect pests is frequently not achieved. Factors contributing to less than 100% control are gas leakage, poor gas distribution, unfavorable exposure

00486 conditions, etc. In addition, some insects are less
 00487 susceptible to hydrogen phosphide than others. To maximize
 00488 control, extreme care must be observed in sealing, higher
 00489 dosages must be used, exposure periods must be lengthened,
 00490 proper application procedures must be followed, and
 00491 temperature and humidity must be favorable.

00492
 00493 C. USE PATTERN

00494 1. INSECT PESTS

00495 Both pellets and tablets are registered with the U. S.
 00496 Environmental Protection Agency as an aid in the control
 00498 of the following insects:

00500 almond moth	khapra beetle
00501 angoumois grain moth	lesser grain borer
00502 bean weevil	maize weevil
00503 cadelle	Mediterranean flour moth
00504 cereal leaf beetle	pink bollworm
00505 cigarette beetle	raisin moth
00506 confused flour beetle	red flour beetle
00507 dermestid beetles	rice weevil
00508 dried fruit beetle	rusty grain beetle
00509 dried fruit moth	saw-toothed grain beetle
00510 European grain moth	spider beetles
00511 flat grain beetle	tobacco moth
00512 fruit fly	yellow meal worm
00513 granary weevil	Africanized bee
00514 greater wax moth	honey bee invested
00515 hairy fungus beetle	with tracheal mite
00516 Hessian fly	
00517 Indian meal moth	

00518
 00519 2. COMMODITIES

00520 Both Dettaphos(R) Pellets and Tablets are registered by
 00521 EPA for the fumigation of the following commodities.

00522
 00523 a. Raw Agricultural Commodities

00524 U almonds	pistachio nuts
00525 barley	popcorn
00526 Brazil nuts	rice
00527 cashews	rye
00528 cocoa beans	safflower seed
00529 coffee beans	sesame seed
00530 corn	seed & pod vegetables
00531 cottonseed	sorghum
00532 dates	soybeans
00533 filberts	sunflower seeds
00534 flower seed	triticale
00535 grass seed	vegetable seed
00536 millet	walnuts
00537 oats	wheat
00538 peanuts	
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00541 pecans

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00543 U b. Processed Foods

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00546 The listed processed foods may be fumigated with

00547 Deltaphos(R). Under no condition shall any

00548 processed food or bagged commodity come in contact

00549 with Deltaphos(R) tablets, pellets or residual dust

00550 except that Deltaphos(R) may be added directly to

00551 processed brewers rice, malt and corn grits for use

00552 in the manufacture of beer.

00554

00555 Processed candy and sugar

00556 Cereal flours and bakery mixes

00557 Cereal foods (including cookies, crackers, macaroni,

00558 noodles, pasta, pretzels, snack foods and

00559 spaghetti)

00560 Processed cereal grains (including milled fractions

00561 and packaged cereals)

00562 Cheese and cheese by-products

00563 Chocolate and chocolate products (assorted

00564 chocolate, chocolate liquor, cocoa, cocoa powder,

00565 dark chocolate coating and milk chocolate)

00566 Processed coffee

00567 Corn grits

00568 Cured, dried and processed meat products and dried

00569 fish

00570 Dates

00571 Dried eggs and egg yolk solids

00572 Dried milk, dried powdered milk, nondairy creamers,

00573 and nonfat dried milk

00574 Dried or dehydrated fruits (apples, dates, figs,

00575 peaches, pears, prunes, raisins and sultanas)

00576 Dried and dehydrated vegetables (beans, carrots,

00577 lentils, peas, potato flour, potato products and

00578 spinach)

00579 Figs

00580 Malt

00581 Peanuts

00582 Processed herbs, spices, seasonings and condiments

00583 Processed nuts (almonds, apricot kernels, Brazil

00584 nuts, cashews, filberts, pecans, pistachio nuts and

00585 walnuts)

00586 Processed oats (including oatmeal)

00587 Rice (brewers rice grits, enriched and polished,

00588 wild rice)

00589 Soybean flour and milled fractions

00590 Processed tea

00591 Yeast (including primary yeast)

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00593 U c. Animal Feed and Feed Ingredients

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00598 U d. Nonfood Products

- 00598
- 00599 Animal hide
- 00600 Clothing
- 00601 Processed or unprocessed cotton, wool and
- 00602 other natural fibers or cloth
- 00603 Feathers
- 00604 Furs
- 00605 Human hair, rubberized hair, vulcanized hair, mohair
- 00606 Leather products
- 00607 Tobacco
- 00608 Wood, cut trees, wood chips and wood and bamboo
- 00610 products
- 00611 Paper and paper products
- 00612 Dried plants and flowers
- 00613 Seeds (grass seed, ornamental herbaceous plant seed
- 00614 and vegetable seed)
- (0615 Straw or hay
- 00616 Tires (for mosquito control)
- 00617

D. DOSAGE GUIDE

00618 Since hydrogen phosphide is a mobile gas and will penetrate
 00619 to all parts of the storage structure, dosage must be based
 00620 upon the total volume of the space being fumigated and not
 00621 on the amount of bulk commodity it contains. For example,
 00622 the same amount of Dettiaphos(R) is required to treat a
 00623 30,000 bushel silo whether it is full or not. The following
 00624 dosage ranges are allowed for bulk and space fumigations.
 00625
 00626

 DOSAGE GUIDE

PRODUCT	PER 1000 CU. FT.	PER 1000 BU. STORAGE CAPACITY
PELLETS	200 - 1450	250 - 1810
TABLETS	40 - 290	50 - 360

NOTE: The maximum dosage allowed for dates, nuts and dried
 fruits is 80 tablets or 400 pellets per 1000 cubic feet.

 These dosages should not be exceeded. It is important to
 realize that shortened exposure period cannot be compensated
 for with an increased dosage.

The wide dosage ranges listed above are designed to
 accommodate the variety of fumigation situations that might
 occur. The major factor in selecting dosage is the
 capability of the structure to hold hydrogen phosphide
 during the exposure period and thus obtain and sustain
 lethal concentrations throughout. It is more difficult to

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00653 obtain penetration of gas throughout the structure in bulk
 00654 stored commodities. An example of this is the treatment of
 00655 grain stored in flat storage in which fumigant cannot be
 00656 uniformly added to the grain but must be probed or surface
 00657 applied.
 00658

00659 Although it is permissible to choose from the full range of
 00660 dosages listed above, the following dosage ranges are
 00661 recommended for the various types of fumigations.
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RECOMMENDED DOSAGES FOR SEVERAL TYPES OF FUMIGATIONS

	TYPE OF FUMIGATION	DOSAGE RANGE		UNIT OF VOLUME*
		PER TON	PER CUBIC FOOT	
00669 U				
00670 U				
00672				
00673	1. SPACE (INCLUDING PACK-			
00674	AGED COMMODITIES)			
00675	A. MILLS, WAREHOUSES,	200- 600	40-120	1000 CU. FT.
00676	ETC.			
00677				
00678	B. BAGGED COMMODITIES	300- 600	60-120	1000 CU. FT.
00679				
00680	C. DRIED FRUITS, NUTS	200- 400	40- 80	1000 CU. FT.
00681	AND DATES			
00682				
00683	D. STORED TOBACCO	200- 400	40- 80	1000 CU. FT.
00684				
00685	2. BULK STORED COMMODITIES			
00686	A. VERTICAL STORAGE	300- 600	60-120	1000 CU. FT.
00687		400- 750	80-150	1000 BUSHELS
00688				
00689	B. TANKS	400- 700	80-140	1000 CU. FT.
00690		500- 900	100-180	1000 BUSHELS
00691				
00692	C. FLAT STORAGE	500-1450	100-290	1000 CU. FT.
00693	(LOOSE CONSTRUCTION)	650-1800	130-360	1000 BUSHELS
00694				
00695	D. FARM BINS	700-1450	140-290	1000 CU. FT.
00696		900-1800	180-360	1000 BUSHELS
00697				
00698	E. RAIL CARS	300- 700	60-140	1000 CU. FT.
00699		400- 900	80-180	1000 BUSHELS
00700				
00701	F. BUNKERS, TARPED	300- 700	60-140	1000 CU. FT.
00702	GROUND STORAGE	400- 900	80-180	1000 BUSHELS
00703				
00704	G. BARGES	300- 800	60-160	1000 CU. FT.
00705		400- 750	80-150	1000 BUSHELS
00706				
00707	H. SHIPHOLDS	300- 660	60-132	1000 CU. FT.
00708		400- 826	80-166	1000 BUSHELS

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*Volume or storage capacity of the area being treated.

The upper dosages listed are recommended in structures that are of loose construction.

E. SEALING

There are many factors affecting a fumigation but most are minor compared to sealing. Proper sealing is necessary to insure effective control of insects and to protect man and other forms of life in adjoining enclosed areas from hydrogen phosphide during the fumigation. Proper sealing must include the closure of all openings except tiny holes or narrow cracks that are very difficult to seal. Maximum results, however, can be achieved if even these are sealed. Polyethylene sheeting and masking or duct tape are adequate sealing materials. Contact Research Products Company for additional information.

F. EXPOSURE GUIDELINES

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

TEMPERATURE TO WHICH FUMIGANT AND/OR INSECTS ARE EXPOSED	PELLETS	TABLETS
Below 40 F	Do Not Fumigate*	Do Not Fumigate*
40 F - 53 F	8 days(192 hrs.)	10 days(240 hrs.)
54 F - 59 F	4 days (96 hrs.)	5 days (120 hrs.)
60 F - 68 F	3 days(72 hrs.)	4 days(96 hrs.)
Above 68 F	2 days(48 hrs.)	3 days(72 hrs.)

The length of the fumigation must be great enough so as to provide for adequate control of the insect pests which infest the commodity being treated. It is necessary to lengthen the fumigation at lower temperatures since insects are more difficult to kill under these conditions. In this regard, the temperature to which the insects are exposed is the critical factor.

There is little to be gained by extending the exposure period if the structure to be fumigated has not been carefully sealed. Careful sealing is required to ensure that adequate gas levels are retained. In fact, it is advisable to seal more tightly for magnesium phosphide than aluminum phosphide since magnesium phosphide generates the gas much more quickly thus allowing more opportunity for leakage. Proper application procedures must be followed to

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00764 provide satisfactory distribution of hydrogen phosphide gas
00765 particularly in the fumigation of bulk commodity contained
00766 in large storages.

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00768 When pellets or tablets are not uniformly added to a bulk
00769 commodity mass (i.e. surface application or shallow probing)
00770 exposure times must be substantially lengthened to allow
00771 penetration of gas throughout the commodity. As a "rule of
00772 thumb" a minimum of 1 day should be added to the exposure
00773 time listed on above for each 10 feet the gas must
00774 penetrate downward. It is preferable to add 2 days for each
00775 10 feet. Some structures can only be treated when
00776 completely tarped.

00777
00778 In addition, the fumigation period should be long enough that
00779 the production of hydrogen phosphide has essentially ceased.
00780 This will minimize worker exposure during further storage
00781 and/or processing of the treated bulk commodity as well as
00782 reduce hazards in the disposal of spent magnesium phosphide
00783 products remaining after space fumigations. Temperature and
00784 humidity to which Detiaphos(R) Pellets and Tablets are
00785 exposed are important to this determination since both lower
00787 temperatures and/or dry air retard gas release. This is
00788 usually not a problem since magnesium phosphide generates
00789 the fumigant gas very quickly.

00790
00791 Consequently, exposure periods recommended in the table are
00792 minimum periods and may not be adequate to control all stored
00793 product pests under all conditions. This is particularly
00794 true at lower temperatures (below 60 degrees F). Nor will
00795 they always provide for the cessation of the production of
00796 hydrogen phosphide when pellets or tablets are exposed to
00797 very low moisture levels. Grain at 70 degrees F and 12
00798 percent moisture provides more than adequate conditions for
00799 fumigation.

00800
00801 If the temperature to which the insects are exposed is
00802 warmer than the temperature to which the pellets or tablets
00803 are exposed (i.e. may occur in a winter space fumigation),
00804 it may be possible to obtain an effective insect kill before
00805 the fumigant is totally spent. In this event it is
00806 permissible to conclude a space fumigation as soon as an
00807 effective kill has been achieved, however in this event the
00808 pellets or tablets must be deactivated prior to disposal.
00809 See deactivation instructions on page of this manual.

00810
00811 Whenever possible, exposure periods should exceed minimum
00812 periods listed above. Remember, the key to effective
00813 results lies with correct dosage, long exposure periods,
00814 proper application procedures and well sealed enclosures.
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00818 Q G. APPLICATION PROCEDURES

00818 1. GENERAL STATEMENT

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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 magnesium phosphide products.

2. APPLICATION PROCEDURES FOR DIRECT ADDITION OF PELLETS OR TABLETS TO BULK COMMODITIES.

a. Commodities: Listed raw agricultural commodities, seeds, wood chips, animal feed and feed ingredients, and processed brewers rice, malt and corn grits used in the manufacture of beer.

b. Storage Structures: Bins, tanks, silos, granaries, flat storage, bunkers, bulk rail cars, etc.

c. Procedures For Vertical Storage: (concrete upright bins and other silo type bins that can be quickly transferred)

(1) For best results all cracks and openings with the exception of fill openings should be closed or sealed prior to fumigating the bin. To this end, vents near the bin top connecting adjacent bins should be sealed prior to the fumigation. If the bin is entered to seal these openings after the fumigant has been added, proper respiratory protection must be worn.

(2) Determine minimum exposure time based on commodity temperature and moisture. Commodity moistures of 12.0% are more than adequate to obtain complete reaction of the fumigant.

(3) Calculate the number of pellets or tablets needed and the rate at which they must be added based upon the rate at which the bin will be filled.

(4) Pellets or tablets may be applied by hand or by an automatic dispenser on the headhouse/gallery belt or into the fill opening. An automatic dispenser may also be used to add fumigant into the upleg of the elevator. Add fumigant in as continuous a manner as possible to the commodity stream.

(5) Seal the bin deck openings after the application is complete.

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- (6) Vertical bins can also be fumigated by deep probing.
- (7) Bins requiring more than 24 hours to fill should not be fumigated by direct addition as the bin is filled. These bins must be fumigated by probing, surface application, or other appropriate methods.
- (8) Post "DANGER" placards on all entrances and on the discharge gate.
- (9) Bins needn't be aerated until they are transferred. Workers must not be over exposed during this transfer.

d. Procedures For Flat Storage: (rectangular shaped bins, tanks, farm style bins and other horizontal bins)

- (1) Check the storage for tightness.
- (2) To the extent practical, seal any vents, cracks or other sources of leaks.
- (3) Determine application procedure to be used. This can include shallow probing, deep probing, uniform addition as the bin is filled, or surface application.

Bins requiring more than 24 hours to fill should not be fumigated by addition as the bin is filled since large quantities of gaseous fumigant may escape before the bin is finally sealed.

Probes should be inserted at horizontal intervals along the length and width of the bin. The number of pellets or tablets per probe is determined by dividing the total number of pellets or tablets by the total number of probings. Pellets or tablets will be dropped into the probes at intervals as the probe is withdrawn. 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 pellets or tablets.

Surface application can be used if the bin can be made sufficiently gas tight to contain the fumigant long enough for it to penetrate throughout. In this instance it is advisable to place 1/4 of the dosage in the floor level aeration ducts. This fumigant must not contact liquid phase water.

- (4) Determine dosage and exposure time. The dosage will depend in large part on a combination of the tightness of the seal, the application procedure and the grain depth. The poorer the

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seal and the farther the gas must penetrate to reach throughout the bin the higher the required dosage will be. For good results add the length of time required for the gas to penetrate throughout the bin to the exposure time given on page of this manual. To the extent possible, lengthen the exposure period. As a "rule of thumb" a minimum of 1 day should be added to the exposure time for each 10 feet the gas must penetrate downward. It is preferable to add 2 days for each 10 feet.

- (5) Arrange enough applicators and other workers to complete the job quickly enough to avoid excessive exposure to hydrogen phosphide gas. The production of gas during application can be significantly retarded by venting flasks outdoors, conducting fumigations when temperatures in the bin are lowest, and other work practices. It is usually advisable, however, to wear approved respiratory protection from start to finish since gas production is much more rapid than when using aluminum phosphide. Monitoring with a suitable detection device is required to assure that the 0.3 ppm 8 hour TWA is not exceeded. See "Industrial Hygiene Monitoring" section on page of this manual.
- (6) It is often advisable as an additional sealing measure to cover the commodity with plastic tarps.
- (7) Seal all remaining exits.
- (8) Post "DANGER" placards on and lock all entrances.
- (9) The bin needn't be aerated unless reentry is required. Consult safety procedures listed elsewhere in labeling.

e. Procedures for Bunkers and Other Outdoor Tarped Commodities:

- (1) See steps "3" and "4" in section "d" above.
- (2) When tarps are being spread over ground storage they should be glued, clamped or otherwise sealed together. Sand or water snakes can be used for a ground seal.
- (3) Application may be made through slits in the tarp or the tarp can be spread over the commodity after application. Seal slits after

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application.

(4) Post "DANGER" placards.

(5) This is an outdoor application so safety monitoring and respiratory equipment are not required.

f. Procedures for Rail Cars, Containers, Trucks, and other Transport Vehicles:

Rail cars, containers, trucks, and other transport vehicles loaded with bulk commodities to which Detiaphos(R) Tablets or Pellets may be added are treated in essentially the same way as any other storage facility. Detiaphos(R) may be added as the vehicle is being filled, the dose may be scattered over the surface after loading has been completed or the tablets or pellets may be probed below the surface. Carefully seal any vents, cracks or other leaks particularly if the fumigation is to be carried out intransit. Remember, rail cars and containers shipped piggyback by rail may be fumigated intransit, but it is not legal to move trucks, trailers, etc., over public roads or highways until they are aerated. See section "III.J" on page of this manual for recommendations on placarding, commodity aeration and training of persons authorized to remove placarding.

Notify the consignee if the commodity is to be shipped under fumigation. If the consignee is unfamiliar with proper handling of fumigated rail cars, it is recommended that they be provided with the necessary information.

g. Procedures for Farm Storage:

(1) General

Since on farm storage is almost always flat storage, refer to "Procedures for Flat Storage" on page of this manual. Except when treating cold and/or very dry grain it is advisable to use aluminum phosphide since the quick gas production with magnesium phosphide may cause greater applicator exposure. The quick gas release can also cause additional gas leakage. The instructions which follow provide additional guidance.

(2) Sealing

Leakage is the single most important cause of failure in the treatment of farm bins. Since these bins are usually small by comparison they

01042 have a higher leakage area in proportion to
 01043 their capacity. Most wooden granaries are so
 01044 porous that they cannot be successfully
 01045 fumigated unless they are completely covered
 01046 with plastic sheeting or similar tarp. Steel
 01047 bins are also usually of very loose construction
 01048 and therefore, require much attention to sealing.
 01049 All vents and aeration ducts must be tightly
 01050 sealed using 4 mil polyethylene sheeting or its
 01051 equivalent. The plastic must be sealed directly
 01052 to the metal with tape or other adhesive. It is
 01053 not sufficient to "cinch up" the plastic as with
 01054 a belt. The surface of the grain should be
 01055 covered with plastic sheeting after Detiaphos(R)
 01056 has been applied. Tarping of the grain surface
 01057 will greatly reduce leakage. Other sealing
 1058 techniques are recommended, i.e. closure of all
 01059 large cracks with caulking, foam insulation or
 01060 other sealant. Sealing these cracks will
 01061 greatly reduce the required dosage. Two mil or
 01062 thicker plastic can be used for tarping the
 01063 grain surface, however, the plastic used on the
 01064 outside of the bin should be at least 4 mils.
 01065 When an entire structure is tarped the plastic
 01066 must be at least 6 mils thick to prevent
 01067 excessive tearing during the fumigation.
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(3) Dosage

01069 Unless all the large cracks are sealed as
 01070 described above the dosage recommended should be
 01071 180-360 tablets or 900-1800 pellets per 1000 bu.
 01072 capacity of the space under the plastic tarp.
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(4) Additional Application Instructions

01075 Probing tablets or pellets into the grain mass
 01076 is the recommended method of application. Probe
 01077 insertions should be scattered evenly over the
 01078 surface. A rigid PVC pipe, about 5 to 7 feet
 01079 long and 1 1/4 inch diameter can be used. In
 01080 this event, use about 20-50 tablets or 100-250
 01081 pellets per probe. The fumigant is gradually
 01082 released into the probe as it is withdrawn from
 01083 the grain. Releasing all the fumigant into the
 01084 probe at once may retard the production of
 01085 hydrogen phosphide and might cause an ignition
 01086 of gas trapped in the clump of pellets or
 01087 tablets. Place no more than 1/4 of the total
 01088 dose in floor level aeration ducts. Be sure the
 01090 inside of the aeration duct is dry before adding
 01091 the pellets or tablets. Addition of
 01092 Detiaphos(R) to water in an aeration duct can
 01093 cause a fire. Seal the aeration fan as
 01094 described above.
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- (5) Additional Precautions
Do not fumigate bins that will be entered by humans or animals prior to aeration. Do not fumigate areas which house equipment containing copper or other metals which will be corroded by hydrogen phosphide. This includes electrical and electronic equipment.
- Place "DANGER" placards on entrances to the bin and near the ladder. See section on "PLACARDING OF FUMIGATED AREAS" on page _____ of this manual.
- 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.
- (6) Post Aeration Treatment
It is good practice to spray the grain surface with an approved insecticide protectant to retard reinfestation and to fog the space above the grain to kill existing adult flying insects.
3. APPLICATION PROCEDURES FOR SPACE FUMIGATIONS.
- a. Procedures for Mills, Warehouses, Food Processing Plants, Chambers, Trucks, Trailers, Containers and other Static Sealable Enclosures
- (1) Determine the dosage of tablets or pellets to be applied based upon the following parameters for space fumigation:
- The volume of the structure
 - The air and/or commodity temperature
 - The general tightness of the structure to be fumigated.
- (2) Determine exposure period based on the "Exposure Guide" on page _____ of this manual.
- (3) Seal all openings except for the door being used to enter and leave. Pay particular attention to openings to connecting or adjacent structures.
- (4) Place trays or sheets of Kraft paper or foil, up to 12 sq. ft. (1.1 sq. m) in area, on the floor throughout the structure to hold Dettaphos(R) Tablets or Pellets.
- (5) Spread Dettaphos(R) on the sheets at a density no greater than 30 tablets per sq. ft. or 75

pellets per sq. ft. This corresponds to slightly more than one half flask of tablets or one half flask of pellets per 3'x4' sheet. Check to see that they have not piled up and that they are spread out evenly to minimize contact between the individual tablets or pellets.

(6) Pellets and tablets may also be applied in moisture permeable envelopes to fumigate commodities. When fumigating in this way the envelopes must be fastened to a substantial support. Place no more than 10 pellets nor more than 2 tablets into one envelope. Detiaphos(R) Pellets and Tablets shall not be placed in or attached to commodity packages intended for retailers.

(7) When fumigating multiple story buildings, each floor is considered a separate enclosure. Application should begin with the top floor and end with the ground floor.

(8) Seal all remaining exits.

(9) Placard and lock all entrances.

(10) Aerate the structure upon completion of the exposure period. Standard aeration time and practices should be developed using a low level detection device. Practices will vary widely at different sites but will usually include opening windows, doors, and vents and activating any ventilation equipment. Reentry of an unaerated structure must be done in pairs wearing appropriate respiratory equipment.

(11) Dispose of remaining dust from tablets or pellets. SEE "STORAGE AND DISPOSAL" on page of this manual. Avoid breathing the dust.

b. Procedures for Space Fumigations Under Tares:

(1) General

Follow the pertinent instructions given immediately above in part "a".

Use of plastic sheeting or tarpaulins to provide a fumigation enclosure is one of the easiest and least expensive means for providing relatively gas tight enclosures which are very well suited for fumigation. Plastic tarps are penetrated only very slowly by hydrogen phosphide gas, and tight coverings are readily formed from the sheets. The volume of these enclosures

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(2) Sealing

An enclosure suitable for fumigation may be formed by covering packaged commodities with plastic sheeting. The sheets may be taped, glued, or clamped 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 plastic sheeting prior to covering for fumigation. The plastic covering of the pile may be sealed to the floor using tape, glue, sand or water snakes, by shoveling soil or sand onto the ends of the plastic covering or by other suitable procedures. The plastic covering should be reinforced by tape or other means around any sharp corners or edges in the stack so as to reduce the risk of tearing. Thinner sheeting, about 2 mils, is suitable for most indoor tarp fumigations. However, 4 mil plastic or thicker is more suitable for outdoor applications where wind or other mechanical stresses are likely to be encountered.

(3) Additional Application Instructions

Tablets or pellets may be applied under the edge of the tarp or through slits. The pellets or tablets should be protected from condensation or other source of water. The slits in the covering should be carefully taped to prevent loss of gas once the dose has been applied. Pellets or tablets must be placed in a single layer. Care should be taken to prevent the plastic tarp from covering the pellets or tablets in such a way as to prevent contact with moist air or to confine the gas. Refer to other sections for dosage and exposure times.

(4) Additional Precautions

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 (i.e. the adding of pellets or tablets to a dispenser for uniform addition to grain). Workers may occupy adjacent indoor areas but they must be protected from overexposure to hydrogen phosphide by adequate sealing, ventilation or as a last resort, respiratory equipment.

Do not walk on stacks during the fumigation.

Place "DANGER" placards at conspicuous points on the

01262 enclosure.

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01264 Follow precautions listed elsewhere in labeling.

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(5) Aeration

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Precautions must be taken to assure that exposure to hydrogen phosphide in excess of allowed limits does not occur both during the fumigation and aeration.

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4. APPLICATION PROCEDURES FOR INTRANSIT FUMIGATION OF SHIP HOLDS

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a. General Information:

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(1) Shipboard fumigation is also regulated by the U.S. Coast Guard Regulations 46 CFR 147A.

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(2) This product is toxic to fish. Keep out of lakes, streams and other aquatic environments. Do not contaminate water by cleaning equipment or disposal of wastes.

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b. Pre-Voyage Fumigation Procedures and Precautions:

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(1) Refer to and comply with the regulations and procedures found in U.S. Coast Guard Regulation, 46 CFR 147A.

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(2) Prior to fumigating a vessel for intransit cargo fumigation, the master of the vessel or his representative, and the fumigator must determine whether the vessel is suitably designed and configured so as to allow for safe occupancy by the ship's crew throughout the duration of the fumigation/voyage.

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If it is determined that the design and configuration of the vessel does not allow for safe occupancy by the ship's crew throughout the duration of the fumigation/voyage, then the vessel will not be fumigated unless all crew members are removed from the vessel. The crew members will not be allowed to re-occupy the vessel until the vessel has been properly aerated and a determination has been made by the master of the vessel and the fumigator that the vessel is safe for occupancy.

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(3) The person responsible for the fumigation must notify the master of the vessel, or his representative of the requirements relating to personal protection equipment*, low range detection equipment and that a person qualified in the use of this equipment must

- 01318 accompany the vessel with cargo under fumigation.
 01319 Emergency procedures, cargo ventilation, periodic
 01320 monitoring and inspections, and first aid measures must
 01321 be discussed with and understood by the master of the
 01322 vessel or his representative.
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- (4) Seal all openings to the cargo hold or tank using
 01324 suitable, water proof, gas tight materials. Lock
 01325 and/or otherwise secure all openings, manways, etc.
 01326 used to enter the hold. Post appropriate "DANGER"
 01327 placards on same.
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- (5) On tankers the over-space pressure relief system
 01330 of each tank must be sealed by (1) the closing
 01331 of appropriate valves and (2) sealing the
 01332 openings into the over-space with gas tight
 01333 materials.
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- (6) Contact appropriate authorities.
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- (7) If the fumigation is not completed and the vessel
 01338 aerated before the manned vessel leaves port, the
 01339 person in charge of the vessel shall insure that at
 01340 least two units of personal protection equipment and
 01341 one gas or vapor detection device and a person
 01342 qualified in their operation be on board the vessel
 01343 during the voyage.
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- (8) During the fumigation or until a manned vessel
 01346 leaves port or the cargo is aerated, the person in
 01347 charge of the fumigation shall insure that a qualified
 01348 person using gas or vapor detection equipment test
 01349 spaces adjacent to the fumigated cargo area and all
 01350 regularly occupied spaces for fumigant leakage.
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 01352 If leakage of the fumigant is detected, the person in
 01353 charge of the fumigation shall take action to correct
 01354 the leakage or shall inform the master of the vessel or
 01355 his representative of the leakage so that corrective
 01356 action can be taken.
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- (9) Review with the master, or his representative, the
 01359 voyage precautions and procedures.
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 01362 *Personal protection equipment means a
 01363 respirator or gas mask fitted with a canister
 01364 designed for phosphine gas which is approved by
 01365 NIOSH/MSHA. A gas mask and canister is approved
 01366 for use up to 15 ppm. Above 15 ppm or at
 01367 unknown concentrations a SCBA or its equivalent
 01368 must be used.
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c. Procedures for Bulk Dry Cargo Vessels and Tankers:

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- (1) Apply either the tablets or pellets by scattering them uniformly onto the commodity surface utilizing as much of the total surface area as possible, or insert them uniformly into the commodity mass by hand or with probes to any depth desired.
- (2) Close and secure hatch covers, tank tops, butterworths, etc. immediately following application.

d. Voyage Precautions and Procedures:

- (1) At regular intervals monitor spaces adjacent to areas containing fumigated cargo and all regularly occupied areas for fumigant leakage using appropriate gas detection equipment.

Special attention should be given to living quarters, kitchens, storerooms, mess halls, keel ducts, day rooms, the bridge, engine room and any other enclosed spaces occupied or frequented by crew members during a voyage.
- (2) If hydrogen phosphide is detected, evacuate the space or area, locate and seal off the source of the leak wearing appropriate respiratory protection equipment. Ventilate the area before allowing occupants to return.
- (3) Do not enter fumigated holds or tanks.
- (4) Do not open, ventilate or aerate the fumigated holds during the voyage.

e. Precautions and Procedures During Discharge:

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

f. Personal Protective Equipment and Monitoring:

- (1) Fully loaded holds on dry bulk carriers are considered an outdoor fumigation.
- (2) Tanker holds which must be entered to fumigate and partially loaded holds on dry bulk carriers are fumigated from within the area being treated.
- (3) See sections "I" and "M" on pages of this manual

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01430 for requirements.

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(4) If hydrogen phosphide is detected 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.

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5. APPLICATION PROCEDURES FOR INTRANSIT FUMIGATION OF CONTAINERS ON SHIPS

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a. When fumigating bulk commodities to which direct addition of pellets or tablets is not allowed or packaged commodities, refer to section "3.a" on page of this manual. Do not place tablets loosely on trays or sheets of paper or foil since movement of the container may disrupt the correct placement of pellets or tablets. Instead they must be applied in moisture permeable envelopes as described in section "3.a.(6)".

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b. When fumigating a commodity by direct addition of pellets or tablets, refer to Section "2.f." on page of this manual.

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c. Intransit fumigation of containers on ships is regulated by Coast Guard Regulation 46 CFR 147A and the applicator or shipper must obtain and comply with U.S. Coast Guard Special permit No. 52-75. Contact the Coast Guard or Research Products Company for additional information.

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d. Comply with general precautions given in labeling.

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6. APPLICATION PROCEDURES FOR FUMIGATION OF BARGES

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a. General
Since barge fumigation is a type of flat storage fumigation as well as having similarities in common with a ship, refer to the sections "Procedures for Flat Storage" on page and "APPLICATION PROCEDURES FOR INTRANSIT FUMIGATION OF SHIP HOLDS" on page .

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Barge fumigation is regulated by the U. S. Coast Guard Regulations 46 CFR 147A as modified by U. S. Coast Guard Special Permit 2-75. The shipper or fumigator must possess this permit prior to fumigating. To obtain this permit contact

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U.S. Coast Guard
Hazardous Materials Branch
Washington, D.C. 20593-0001.

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b. Sealing
Special care must be taken in determining whether a barge is suitable for fumigation. Excessive leakage may occur

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01486 through poorly sealed hold covers.

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7. APPLICATION PROCEDURES FOR FUMIGATION OF RODENT AND MOLE BURROWS

a. List of Burrowing Pests

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

b. Application Instructions

Add from 2 to 8 Detiaphos(R) Tablets or 10 to 40 Detiaphos(R) Pellets to each burrow opening. Seal tightly by shoveling soil over the entrance. Place the pellets or tablets far enough down the burrow that the soil used to plug the burrow doesn't cover the pellets or tablets, slowing down their action. Where possible, subsurface tunnels or runways should be treated every 5 to 10 feet with a dose of 4 to 8 tablets or 20 to 40 pellets. Use lower rates in smaller burrows, in tight soils, under moist soil conditions and higher rates in larger burrows, in porous soils and/or 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. Treat reopened burrows and fresh runways a second time 1 to 3 days after the initial treatment.

Detiaphos(R) 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.

c. Environmental Hazards

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

d. Endangered Species Restrictions

The use of Detia(R) ROTOX(R) in a manner that may kill or otherwise harm an endangered or threatened

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01544 species or adversely modify their habitat is a
 01545 violation of federal laws. Before using this
 01546 pesticide on range and/or pastureland in the
 01547 counties listed below, you must obtain the PESTICIDE
 01548 USE BULLETIN FOR PROTECTION OF ENDANGERED SPECIES
 01549 for the county in which the product is to be used.
 01550 The bulletin is available from your county extension
 01551 agent, state fish and game office, or your pesticide
 01552 dealer. Use of this product in a manner
 01553 inconsistent with the PESTICIDE USE BULLETIN FOR
 01554 PROTECTION OF ENDANGERED SPECIES is a violation of
 01555 federal laws.

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 01557 Even if applicable county bulletins do not prohibit
 01558 the use of this product at the intended site of
 01560 application, you may not use this product for
 1561 control of prairie dogs in the states of Arizona,
 01562 Colorado, Kansas, Montana, Nebraska, New Mexico,
 01563 North Dakota, Oklahoma, South Dakota, Texas, Utah or
 01564 Wyoming unless a pre-control survey has been
 01565 conducted. Contact the nearest U.S. Fish and
 01566 Wildlife Service endangered species specialist to
 01567 determine survey requirements in your area. This
 01568 survey must be in compliance with the black-footed
 01569 ferret survey guidelines, developed by the U.S. Fish
 01570 and Wildlife Service, and a determination must be
 01571 made in accordance with the guidelines that
 01572 black-footed ferrets are not present in the
 01573 treatment area.

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 01575 CALIFORNIA
 01576 Fresno, Inyo, Kern, Kings, Madera, Merced, Monterey,
 1577 San Benito, San Luis Obispo, Santa Barbara,
 01578 Stanislaus and Tulare

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 01580 FLORIDA
 01581 Statewide

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 01583 GEORGIA
 01584 Appling, Atkinson, Bacon, Baker, Ben Hill, Bleckley,
 01585 Berrien, Brantley, Brooks, Bryan, Bullock, Calhoun,
 01586 Camden, Candler, Charlton, Chatham, Clinch, Coffee,
 01587 Colquitt, Cook, Crisp, Decatur, Dodge, Dooly,
 01588 Daugherty, Early, Echols, Effingham, Emanuel, Evans,
 01589 Glynn, Grady, Irwin, Jeff Davis, Jenkins, Johnson,
 01590 Lanier, Laurens, Lee, Liberty, Long, Lowndes, Macon,
 01591 McIntosh, Miller, Mitchell, Montgomery, Pierce,
 01592 Pulaski, Screven, Seminole, Telfair, Tattnall,
 01593 Thomas, Tift, Toombs, Treutlen, Turner, Ware, Wayne,
 01594 Wheeler, Wilcox and Worth

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 01596 NEW MEXICO
 01597 Hidalgo

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 01599 UTAH
 01600 Beaver, Garfield, Iron, Kane, Piute, Sevier,
 01601 Washington and Wayne
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 01603 WYOMING
 01604 Albany
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 01607 e. Special Local Restrictions
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 01609 (1) NORTH CAROLINA
 01610 Deltaphos(R) Tablets and Pellets may only be
 01611 used for control of rats and mice in the state
 01612 of North Carolina. Use against other pests is
 01613 not permitted.
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 01615 (2) OKLAHOMA
 01616 A special permit for black-tailed prairie dog control
 01617 by poisoning is required in Oklahoma. Contact the
 01618 Oklahoma State Department of Wildlife Conservation to
 01619 obtain this permit.
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 01621 (3) WISCONSIN
 01622 A state permit is required for use of pesticides in
 01623 Wisconsin to control small mammals, except rats or
 01624 mice. Please contact your local Department of Natural
 01625 Resources office for information.
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 01627 (4) INDIANA
 01628 Use of Deltaphos(R) Tablets or Pellets for mole
 01629 control is not legal in the state of Indiana.
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 01631 (5) MISSOURI
 01632 A state permit is required for use of pesticides in
 01633 Missouri to control small mammals, except rats and
 01634 mice. Please contact the Missouri Department of
 01635 Conservation office for information.
 01636
 01637 (6) KANSAS
 01638 A special permit for black-tailed prairie dog control
 01639 by poisoning is required in Kansas. Contact the Kansas
 01640 Fish and Game Commission to obtain this permit.
 01641
 01642 (7) CALIFORNIA
 01643 Use of Deltaphos(R) Tablets and Pellets for
 01644 chipmunk control is not legal in the state of
 01645 California.
 01646
 01647
 01648 B. APPLICATION PROCEDURES FOR FUMIGATION OF BEEHIVES, SUPERS
 01649 AND OTHER BEEKEEPING EQUIPMENT
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 01651 Deltaphos(R) Tablets and Pellets may be used for the
 01652 control of the greater wax moth in stored beehives,

01653 supers and other beekeeping equipment and for the
01654 destruction of bees, Africanized bees, and diseased bees
01655 including those infested with tracheal mites and
01656 foulbrood. The recommended dosage for this use is 60-90
01657 tablets or 300-450 pellets per 1000 cu. ft.
01658

01659 Fumigations may be performed in chambers at atmospheric
01660 pressure, under tarpaulins, etc., by placing the tablets or
01661 pellets on trays or in moisture permeable envelopes. Do not
01662 add more than 2 tablets or 10 pellets to each envelope. Honey
01663 from treated hives or supers may only be used for bee food.
01664

01665 9. COLD WEATHER TOBACCO FUMIGATION

01666 An effective tobacco fumigation can be achieved at 40
01667 degrees F. This temperature is the temperature to which
01668 the pellets or tablets are exposed, not the outdoor
(669 temperature. The fumigation should last at least 96
01670 hours prior to aeration. Since this is a shorter
01671 exposure period than normally used at cold temperatures,
01672 extra care should be taken to assure the fumigant is
01673 spent prior to disposal. The wet or dry method of
01674 deactivation may be used, however, when using the dry
01675 method the dust must not be accumulated so as to confine
01676 the gas being released. The wet method of deactivation
01677 is recommended.

- 01678 Q H. PROTECTIVE CLOTHING
- 01680 Wear dry gloves made of cotton or other material when
- 01681 contact with tablets, pellets, or their dust is likely.
- 01682 Wash hands after use.
- 01683
- 01684 I. RESPIRATORY PROTECTION
- 01685 1. WHEN RESPIRATORY PROTECTION MUST BE WORN
- 01686
- 01687 NIOSH/MSHA approved respiratory protection must be worn
- 01688 during exposure to concentrations in excess of permitted
- 01689 limits or when concentrations are unknown.
- 01690
- 01691 2. PERMISSIBLE GAS CONCENTRATION RANGES FOR RESPIRATORY
- 01692 PROTECTION DEVICES
- 01693
- 01694 A NIOSH/MSHA approved, full face gas mask - hydrogen
- 01695 phosphide canister combination may be used at levels up
- 01696 to 15 ppm or to escape from levels up to 1500 ppm.
- 01697 Above this level or in situations where the hydrogen
- 01698 phosphide concentration is unknown, a NIOSH/MSHA
- 01699 approved, self-contained breathing apparatus (SCBA) or
- 01700 its equivalent must be used. The NIOSH/OSHA Pocket
- 01701 Guide, 8-85, DHEW/NIOSH 78-210, lists these and other
- 01702 types of approved respirators and the concentration
- 01703 limits at which they may be used.
- 01704
- 01705 3. REQUIREMENTS FOR AVAILABILITY OF RESPIRATORY PROTECTION
- 01706
- 01707 Respiratory protection must be available at the site of
- 01708 application in case it is needed when applying
- 01709 Deltaphos(R) from within the structure being fumigated.
- 01710 An approved full face gas mask - phosphine canister
- 01711 combination or self-contained breathing apparatus (SCBA)
- 01712 or its equivalent must be available at the site of
- 01713 application. If SCBA or its equivalent is not available
- 01714 at the application site, it must be available locally,
- 01715 for example, at a fire station or rescue squad.
- 01716
- 01717 Respiratory protection need not be available for
- 01718 application from outside the area to be fumigated such
- 01719 as addition of tablets or pellets to automatic
- 01720 dispensing devices, etc., if exposures above the
- 01721 permitted exposure limit will not be encountered.
- 01722
- 01723 Respiratory protection need not be available for outdoor
- 01724 applications.
- 01725
- 01727 If respiratory equipment is not available on a farm the
- 01728 application must be done from outside the structure.
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- 01730 J. PLACARDING OF FUMIGATED AREAS
- 01731 The applicator must placard or post all entrances to the
- 01732 fumigated area with signs bearing:

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1. The signal word "DANGER/FELIGRO" and the SKULL and CROSSBONES symbol in red.
2. The statement, "Area and/or commodity under fumigation, DO NOT ENTER/NO ENTRE".
3. The statement "This sign may only be removed after the commodity is completely aerated (contains 0.3 ppm or less 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, 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 railroad hopper cars, placarding must be placed securely on both sides of the car near the ladders and next to the top hatch into which the fumigant is introduced.

Do not remove a placard until the treated commodity is aerated down to 0.3 ppm or less. To determine whether aeration is complete, each fumigated site or vehicle must be monitored and shown to contain 0.3 ppm or less hydrogen phosphide gas in the air space around and, when feasible, in the mass of the commodity.

Transfer of incompletely aerated commodity to a new site is permissible, however, the new storage must be placarded if it contains more than 0.3 ppm hydrogen phosphide.

Workers who handle incompletely aerated commodity must be informed and appropriate measures must be taken (i.e., ventilation or respiratory protection) to prevent exposures from exceeding the exposure limits for hydrogen phosphide.

It is recommended that the person responsible for removing the placards be familiar with the physical, chemical and toxicological properties of hydrogen phosphide. They should also be knowledgeable in how to take gas readings, exposure limits, symptoms and first aid treatment for hydrogen phosphide poisoning.

K. 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

01787 trace amounts on up. Use instructions are enclosed with
 01788 each purchase. Consult your local supplier of such
 01789 equipment or contact Research Products Company for more
 01790 information.
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L. AERATION OF FUMIGATED COMMODITIES

1. FOODS AND FEEDS

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

2. TOBACCO

Tobacco must be aerated for at least three days (72 hours) when fumigated in hogsheads and for at least two days (48 hours) when fumigated in other containers. When plastic liners are used, longer aeration periods will probably be required to aerate the commodity down to 0.3 ppm.

3. 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.

M. APPLICATOR AND WORKER EXPOSURE

1. 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.

2. APPLICATION OF FUMIGANT

Depending upon temperature and humidity, Dettlaphos(R) Tablets and Pellets release hydrogen phosphide gas upon exposure to moisture from the air. This release is 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

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01841. the fumigator's exposure exceeds the 8 hour TWA of 0.3
 01842 ppm, approved respiratory protection must be worn. Gas
 01843 concentration measurements for safety purposes must be
 01844 made using low level detector tubes or other suitable
 01845 low level detection equipment. See the "Industrial
 01846 Hygiene Monitoring" section below. Information on
 01847 hydrogen phosphide (phosphine, PH₃) detector tubes may
 01848 be obtained from Research Products Company.
 01849

01850 It is usually advisable to wear approved respiratory
 01851 protection from start to finish. This is particularly
 01852 true when performing large space fumigations or when
 01853 fumigating bulk stored commodities in flat storage
 01854 buildings.
 01855

3. LEAKAGE FROM FUMIGATED SITES

01856 Hydrogen phosphide is highly mobile and given enough
 01857 time may penetrate seemingly gas tight materials such as
 01858 concrete and cinder block. Therefore, adjacent,
 01859 enclosed areas likely to be occupied should be examined
 01860 to ensure that significant leakage has not occurred.
 01861 Sealing of the fumigated site and/or air flow in the
 01862 occupied areas should be used to reduce exposure.
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4. AERATION AND REENTRY

01865 If the area is to be entered after fumigation, it must
 01866 be aerated until the level of hydrogen phosphide gas is
 01867 0.3 ppm or below. The area or site must be monitored to
 01868 ensure that liberation of gas from the treated commodity
 01869 does not result in the development of unacceptable
 01870 levels of hydrogen phosphide. Do not allow reentry into
 01871 treated areas by any person before this time unless
 01872 protected by an approved respirator.
 01873

5. HANDLING UNAERATED COMMODITIES

01874 Transfer and processing of a treated commodity prior to
 01875 complete aeration is permissible, however, workers must
 01876 not be exposed to hydrogen phosphide in excess of the
 01877 permitted exposure limits.
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6. INDUSTRIAL HYGIENE MONITORING

01880 It is recommended that hydrogen phosphide exposure be
 01881 documented in an operation log or manual for each site
 01882 and operation where exposure may occur. The purpose of
 01883 this monitoring is to prevent excessive exposure and to
 01884 determine when and where respiratory protection is
 01885 required. This monitoring is mandatory although once
 01886 exposures have been adequately characterized, subsequent
 01887 monitoring is not routinely required. However, spot
 01888 checks should be made occasionally, especially if
 01889 conditions significantly change or an unexpected garlic
 01890 odor is detected. Gas concentration measurements should
 01891 be taken in the worker's breathing zone. Monitoring is
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01874 not required outdoors.

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7. ENGINEERING CONTROLS AND WORK PRACTICES

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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.

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N. STORAGE AND DISPOSAL

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1. STORAGE

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Flasks 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.

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Detiaphos(R) Tablets and Pellets are supplied in gas tight 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. The shelf life of Detiaphos(R) is virtually unlimited if the containers are tightly sealed.

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

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2. DISPOSAL OF UNREACTED OR PARTIALLY REACTED TABLETS OR PELLETS

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(From spills, leaking flasks or other sources) Unreacted or partially reacted Detiaphos(R) Pellets or Detiaphos(R) Tablets are 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.

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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.

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FOR SPECIFIC INSTRUCTIONS SEE "SPILL AND LEAK PROCEDURES" ON PAGE OF THIS MANUAL.

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3. DISPOSAL OF PELLET OR TABLET DUST FOLLOWING A SPACE FUMIGATION
- a. General
- If properly exposed, the residual dust remaining after a fumigation with Dettiaphos(R) will be a grayish white, spent, nonhazardous waste and will contain only a small amount of unreacted magnesium phosphide. In fact, magnesium phosphide even reacts more completely than aluminum phosphide. However, disposal of incompletely exposed magnesium phosphide is more hazardous than disposal of incompletely exposed aluminum phosphide because the former has a faster reaction rate leading to high gas concentrations more quickly in a confined area. Therefore, residual dust from incompletely exposed pellets or tablets (See "EXPOSURE GUIDE" on page of this manual.) will require special care. Confinement of partially spent residual dust, as in a closed container, or collection and storage of large quantities of this dust may result in a fire hazard. Small amounts of hydrogen phosphide may be given off from the unreacted magnesium phosphide, and confinement of the gas may result in a flash. UNLESS IT CAN BE DETERMINED WITH CERTAINTY THAT THIS DUST IS SPENT IT MUST BE HELD FOR SEVERAL DAYS BEYOND THE REQUIRED EXPOSURE TIME PRIOR TO DISPOSAL OR THE WET METHOD (SEE BELOW) OF DEACTIVATION MUST BE USED. IF THE DUST RETAINS ANY OF ITS GREENISH COLOR THE WET METHOD IS RECOMMENDED.
- 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 (8 flasks of tablets or 10 flasks of pellets) of residual dust in each bag. Always transport these bags in an open vehicle. Do not pile bags. 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 Dettiaphos(R) may be collected and disposed of at a sanitary landfill, approved pesticide incinerator or other approved sites or by other procedures approved by federal,

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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. Detergent need not be used for magnesium phosphide. Use no less than 10 gallons of water for each case of spent material. Partially spent pellets and tablets may react quite vigorously during wet deactivation if they were exposed under cold and/or dry conditions or if the fumigation period was shortened. It is suggested that a small portion of the product be tested prior to immersing large amounts of materials in water if it is suspected that the product contains considerable unreacted magnesium phosphide. Due to the reactivity of magnesium phosphide, additions to the water should be made slowly and carefully. Allow the mixture to stand with occasional stirring. Wear appropriate respiratory protection. DO NOT COVER THE CONTAINER AT ANY TIME. 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. If it is held 6 hours it may be poured into a storm sewer.

4. DISPOSAL OF EMPTY FLASKS

a. 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. Dispose of rinsate in a sanitary landfill or by other approved procedures. Small quantities can be poured out on the ground.

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

0. SPILL AND LEAK PROCEDURES

1. GENERAL

A spill other than incidental to application or normal

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handling or punctured flasks can produce high levels of gas, and therefore, attending personnel must wear a SCBA or its equivalent when the concentrations of hydrogen phosphide gas is unknown. If the concentration is known, other NIOSH/MSHA approved respiratory protection can be worn. Wear dry cotton or other gloves when handling spilled material.

2. DAMAGE TO FIBERBOARD CASE

Check aluminum flasks. 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.

3. LEAKING FLASK PROCEDURES

If aluminum flasks have been punctured or damaged causing a leak, the product may be immediately used, the container may be temporarily repaired with aluminum tape or the Detiaphos(R) may be transferred from the damaged flask to a sound metal container which should be sealed and properly labeled as magnesium phosphide. Transport the damaged containers to an area suitable for pesticide storage for inspection. Further instructions and recommendations may be obtained, if required, from Research Products Company.

Handle empty damaged containers as described under "DISPOSAL OF EMPTY FLASKS" above.

4. SPILL PROCEDURES

Do not flush spillage down drain with water. DO NOT use water at anytime to clean up a spill. Water in contact with unreacted tablets or pellets 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 flask or other sound metal container and tighten the cap. If possible, use immediately. CAUTION: AN IGNITION MAY OCCUR WHEN THESE CONTAINERS ARE REOPENED.

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 transported in open vehicles to a suitable area away from occupied buildings. Wet or dry deactivation may then be carried out as described in the section immediately below.

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5. DEACTIVATION AND DISPOSAL OF UNREACTED OR PARTIALLY REACTED TABLETS OR PELLETS

a. 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.

Detergent need not be used for magnesium phosphide. Each flask of tablets or pellets should be mixed with no less than 1 gallon of water. Partially spent pellets or tablets may react quite vigorously during wet deactivation if they were exposed under cold and/or dry conditions or if the fumigation period was shortened. It is suggested that a small portion of the product be tested prior to immersing large amounts of material in water if it is suspected that the product contains considerable unreacted magnesium phosphide. Due to the reactivity of magnesium phosphide, additions to the water should be made slowly and carefully. Allow the mixture to stand with occasional stirring. Stir occasionally thereafter for at least 6 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 sanitary landfill or other suitable burial site approved by local authorities. Where permissible this slurry may be poured into a storm sewer or out onto the ground.

b. Dry Method

As an alternative to the wet method, when permissible small amounts (up to 5 flasks) of partially reacted or unreacted material may be spread out in an open, secure area away from occupied buildings to be deactivated by atmospheric moisture.

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.