

25476-111 1/84

ACCEPTED
with CONCURRENCE
in EPA Letter Dated:

MAR 16 1987

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

2548-67

NETIAPHOS FELLET 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 attached 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 Ingredients: 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

01900 Symptoms of overexposure to hydrogen phosphide are headache, dizziness, nausea, difficult breathing, vomiting and diarrhea.
02000 In all cases of overexposure get medical attention immediately.
02050 Take victim to the doctor or emergency treatment facility.

02150 IF GAS OR DUST FROM PELLETS IS INHALED: Get exposed person to
02200 fresh air. Keep warm and make sure person can breathe freely.
02250 If breathing has stopped, give artificial respiration by ...
02300 mouth-to-mouth or other means of resuscitation. Do not give
02350 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

03350 See side panels for additional precautionary statements.

03400
03450 Manufactured by: Detia Freyberg, GMBH
03500 P. O. Box 10
03550 6947 Laudenbach
03600 F.R. of Germany
03650
03700

03750 Distributed by: Research Products Company
03800 Div. of McShares, Inc.
03850 P. O. Box 1460
03900 Salina, KS 67402-1460
03950
04000

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

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

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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 Detiaphos(R) Pellets and Detiaphos(R) Tablets" and "Instructions for Intransit Fumigation of Ship Holds with Detiaphos(R) Pellets and Tablets" are a part of labeling. Refer to them for application procedures and other information necessary to properly use

07750 Detiaphos(R) Pellets.

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07950 THIS PRODUCT IS ACCCOMPANIED BY THE LABELING LISTED ABOVE. READ
08000 AND UNDERSTAND THE ENTIRE LABELING. ALL PARTS OF THE LABELING
08050 ARE EQUALLY IMPORTANT FOR SAFE AND EFFECTIVE USE OF THIS
08100 PRODUCT. CALL RESEARCH PRODUCTS COMPANY OR EPA IF YOU HAVE ANY
08150 QUESTIONS OR DO NOT UNDERSTAND ANY PART OF THIS LABELING.

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STORAGE AND DISPOSAL

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08400 STORAGE

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08500 Flasks should be stored in a dry, well ventilated area, away
08550 from heat and under lock and key. Post as a pesticide storage
08600 area. Do not contaminate water, food or feed by storing
08650 pesticides in the same areas used to store these commodities.

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08750 Do not store in buildings where humans or domestic animals
08800 reside. Refer to the booklet "Application Procedures for
08850 Detiaphos(R) Pellets and Detiaphos(R) Tablets" for additional
08900 storage instructions.

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09000 DISPOSAL OF UNREACTED OR PARTIALLY REACTED PELLETS (From spills,
09050 leaking flasks or other sources)

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09150 Unreacted or partially reacted Detiaphos(R) Pellets are acutely
09200 hazardous. Improper disposal of this product is a violation of
09250 federal law.

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09350 If this product cannot be disposed of by ordinary use or
09400 according to labeling instructions, contact your state pesticide
09450 or environmental control agency or the hazardous waste
09500 representative at the nearest EPA regional office for guidance.
09550 Do not contaminate water by disposal.

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09650 Reacted pellets are not hazardous. For complete disposal, spill
09700 and leak procedures refer to the booklet "Application Procedures
09750 for Detiaphos(R) Pellets and Detiaphos(R) Tablets".

09800

09850 DISPOSAL OF EMPTY FLASKS

09900

10000 METHOD ONE: Triple rinse flasks and stoppers with water. Then
10050 offer for recycling or reconditioning, or puncture and dispose
10100 of them in a sanitary landfill or other approved site or by
10150 other procedures approved by state and local authorities.
10200 Dispose of rinsate in a sanitary landfill or by other approved
10250 procedures.

10300

10350 METHOD TWO: Remove lids and place empty flasks outdoors or in
10400 structure being fumigated until residue in flasks is reacted.

10450 Puncture and dispose of them in a sanitary landfill or other
10550 approved site or by other procedures approved by state and local
10600 authorities.

10650
10700 GENERAL

10750
10800 Consult federal, state and local disposal authorities for
10850 approved procedures other than those given above. Approved
10900 procedures vary for different types of generators.

10950
11000 *If in doubt concerning whether the dust is reacted and/or
11050 concerning proper disposal techniques contact Research Products
11100 Company.

ACCEPTED
with COMMENTS
In EPA Letter Dated:

MAR 16 1987

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

2548-67

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 these uses covered by the applicator's certification or persons trained in accordance with the attached 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.

APPLICATION PROCEDURES
FOR
Retail Leases (R)

PELLETS

AND

Detiaphes (R.)

TABLETS

HYDROGEN PHOSPHITE FUMIGANTS

FOR

USE AGAINST LISTED INSECTS

WHICH INFEST LISTED RAW AGRICULTURAL
COMMODITIES, ANIMAL FEEDS, PROCESSED FOODS,
NONFOOD PRODUCTS AND STORED TOBACCO

Research Products Germany

Div. of McShares, Inc.

P. O. Box 1460

Salina, Kansas 67402-1460

EPA Establishment No. 33982WGO1

EPA Registration No. 2548-677

EPA Registration No. 2548-68

00040 P

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00072 P

I. INTRODUCTION

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 inert 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 10.81 grams hydrogen phosphide, the tablet about 0.85 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)

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

C. PRODUCT PACKAGING

The tablets are packaged 500 to a flask. The pellets are packaged 1660 to a flask.

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

Q. WHAT IS HYDROGEN PHOSPHIDE?

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

E. SAFETY RECOMMENDATIONS

1. Carefully read the labeling and follow instructions explicitly.
2. Never work alone when applying fumigant from within the storage structure.
3. Never allow uninstructed persons to handle Detiaphos(R).
4. Approved respiratory protection must be available for the fumigation of structures from within.
5. Wear dry gloves made of cotton or other material when contact with tablets, pellets or their dust is likely.
6. It is preferable to open fumigant containers in open air or near a fan that exhausts outside immediately. Never open in a flammable atmosphere.
7. Do not allow Detiaphos(R) to contact liquid water or to pile up.
8. Dispose of empty containers and spent residual dust in a proper manner consistent with the label instructions.
9. Post "DANGER" signs on fumigated areas.
10. Notify appropriate company employees, and provide relevant safety information to local officials annually for use in the event of an emergency.
11. Hydrogen phosphide fumigants are not to be used for vacuum fumigations.
12. Exposure to hydrogen phosphide must not exceed the 8 hour TWA of 0.3 ppm during application or a maximum concentration of 0.3 ppm after application is completed. This includes reentry into a structure.
13. Fumigated finished foods and feeds must be aerated 48 hours prior to offering to the end consumer.
14. Transfer of a treated commodity to another site without

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
00220 the above condition be referred for medical attention.
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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 Detiaphos(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 or preop~~ ~~Industrial Hygiene Monitoring or preop~~ applicator/worker exposure 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.

U 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

00264 means of resuscitation. Do not give anything by mouth
00265 to an unconscious person.

00266

00268 U 2. If 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

00278 U 3. If pellets, tablets or their dust gets on skin or
00278 U clothing: Brush or shake material off clothes and shoes in
00279 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
00283 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,
00301 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.

00319

00320 The following measures are suggested for use by the
00321 physician in accordance with his own judgment:

00322
00323 1. In its milder to moderate forms (symptoms of
00324 poisoning may take up to 24 hours to make their
00325 appearance), the following is suggested:
00326
00327 a. Complete rest 1-2 days during which the patient must
00328 be kept quiet and warm.
00329
00330 b. If the patient suffers from vomiting or increased
00331 blood sugar, appropriate solutions should be
00332 administered. Treatment with oxygen is recommended
00333 as is the administration of cardiac and circulatory
00334 stimulants.
00335
00336 2. In cases of severe poisoning (intensive care unit
00337 recommended):
00338
00339 a. Where pulmonary edema is observed, steroid therapy
00340 should be considered and close medical supervision
00341 is recommended. Blood transfusions may be
00342 necessary.
00343
00344 b. In case of manifest pulmonary edema, venesection
00345 should be performed under vein pressure control.
00346 Heart glycosides (I.V.) can be used in case of
00347 hemoconcentration. Venesection may result in shock.
00348 In the case of progressive edema of the lungs,
00349 immediately intubate and remove edema fluid and
00350 administer oxygen over-pressure respiration, as well
00351 as any measures required for shock treatment. In
00352 case of kidney failure, extracorporeal hemodialysis
00353 is necessary. There is no specific antidote known
00354 for this poisoning.
00355
00356 c. If pellets or tablets are ingested, induce vomiting.
00357 Flush the stomach with a diluted potassium
00358 permanganate solution or a solution of magnesium
00359 peroxide until flushing liquid ceases to smell of
00360 carbide. Thereafter, apply carbomedicinalis.
00361

00362 II. PHYSICAL AND CHEMICAL HAZARDS

00363 Magnesium phosphide in tablets, pellets or partially spent
00364 dust will release hydrogen phosphide gas if exposed to
00365 moisture from the air or if it comes into contact with
00366 water, acids or many other liquids. Piling of tablets,
00367 pellets or dust from their fragmentation may cause a
00368 temperature increase and confine the release of gas so that
00369 ignition could occur. Since magnesium phosphide is also much
00370 more reactive than products containing aluminum phosphide,
00371 Metaphos(R) will present more hazard if it is contacted
00372 with liquid water, allowed to pile up or is confined so long
00373 as to allow the gas concentration to exceed the flammable
00374 limits.

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

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

III. DIRECTIONS FOR USE

A. GENERAL

1. It is a violation of federal law to use this product in a manner inconsistent with its labeling. Detiaphos(R) Tablets and Pellets are Restricted Use Pesticides due to the acute inhalation toxicity of 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 ~~attached~~ 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.
2. Detiaphos(R) is a highly hazardous material and may be used only by individuals trained in its proper use. Before using, read and follow the label precautions and directions on the label and in labeling.

Additional copies of this manual are available from:

Research Products Company
P. O. Box 1460

10430 Salina, Kansas 67402-1460
10431 913-825-2181

10432
10433 3. Magnesium phosphide fumigants such as Detiaphos(R) are
10434 more reactive than products containing aluminum
10435 phosphide as the active ingredient. In general,
10436 Detiaphos(R) is intended for use where cooler and/or
10437 drier exposure conditions prevail, where aluminum
10438 phosphide might not break down properly. It is
10439 recommended that Detiaphos(R) aluminum phosphide be used at
10440 higher temperatures and humidities.

10441
10442 4. At least two trained persons must be present when
10443 Detiaphos(R) Pellets or Detiaphos(R) Tablets are applied
10444 from within the space being treated or during reentry
10445 into a fumigated or partially aerated site. Only one
10446 trained person is required when the fumigant is applied
10447 from outside the area to be treated.

10448
10449 5. Prior to applying this product, you must inspect the
10450 storage structure to determine if it can be made
10451 sufficiently gas tight. Decide how personal exposure
10452 monitoring should be conducted. Notify appropriate
10453 company employees and provide relevant safety
10454 information to local officials annually for use in the
10455 event of an emergency. Apply this fumigant in an
10456 effective and safe manner including emergency procedures
10457 etc.

10458
10459 6. Shipholds, barges, containers on ships, railroad cars
10460 and containers shipped piggyback by rail may be
10461 fumigated in transit. However, fumigated trucks, vans,
10462 trailers and similar transport vehicles cannot be moved
10463 over public roads or highways until they are aerated.

10464
10465 7. Pellets and/or tablets or their reacted residues must
10466 not come into contact with any processed food with the
10467 EXCEPTION that both can be added directly to processed
10468 beers, rice, malt, and corn grits used in the
10469 manufacture of beer.

10470
10471 8. Protect copper, silver, gold and their alloys from
10472 corrosive exposure to hydrogen phosphide.

10473
10474 9. Do not fumigate commodities with this product when
10475 commodity temperature is below 40 degrees F (5 degrees
10476 C). The only exception to this rule is cold weather
10477 tobacco fumigation. See page 11 of this manual.

10478 10. EFFICACY

10479 Complete control of listed insect pests is frequently not
10480 achieved. Factors contributing to less than 100% control
10481 are gas leakage, poor gas distribution, unfavorable exposure
10482

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00493 conditions, etc. In addition, some insects are less
susceptible to hydrogen phosphide than others. To maximize
control, extreme care must be observed in sealing, higher
dosages must be used, exposure periods must be lengthened,
proper application procedures must be followed, and
temperature and humidity must be favorable.

00494 C. USE PATTERN

00495 1. INSECT PESTS

00496 Both pellets and tablets are registered with the U. S.
00497 Environmental Protection Agency as an aid in the control
00498 of the following insects:

00500 almond moth	00501 angoumois grain moth	00502 bean weevil	00503 cadelle	00504 cereal leaf beetle	00505 cigarette beetle	00506 confused flour beetle	00507 dermestid beetles	00508 dried fruit beetle	00509 dried fruit moth	00510 European grain moth	00511 flat grain beetle	00512 fruit fly	00513 granary weevil	00514 greater wax moth	00515 hairy fungus beetle	00516 Hessian fly	00517 Indian meal moth	00518	00519 khapra beetle	00520 lesser grain borer	00521 maize weevil	00522 Mediterranean flour moth	00523 pink bollworm	00524 raisin moth	00525 red flour beetle	00526 rice weevil	00527 rusty grain beetle	00528 saw-toothed grain beetle	00529 spider beetles	00530 tobacco moth	00531 yellow meal worm	00532 Africanized bee	00533 honey bee infested	00534 with tracheal mite
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00525 2. COMMODITIES

00526 Both Detiaphos(R) Pellets and Tablets are registered by
00527 EPA for the fumigation of the following commodities.

00528 a. Raw Agricultural Commodities

00529 1. almonds	00530 2. barley	00531 3. Brazil nuts	00532 4. cashews	00533 5. cocoa beans	00534 6. coffee beans	00535 7. corn	00536 8. cottonseed	00537 9. dates	00538 10. filberts	00539 11. flower seed	00540 12. grass seed	00541 13. millet	00542 14. oats	00543 15. Peanuts	00544 16. wild rice	00545 17. leleci	00546 18. wheat
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b. Processed Foods

The listed processed foods may be fumigated with Detiaphos(R). Under no condition shall any processed food or bagged commodity come in contact with Detiaphos(R) tablets, pellets or residual dust except that Detiaphos(R) may be added directly to processed brewers rice, malt and corn grits for use in the manufacture of beer.

Processed candy and sugar

Cereal flours and bakery mixes

Cereal foods (including cookies, crackers, macaroni, noodles, pasta, pretzels, snack foods and spaghetti)

Processed cereals (including milled fractions and packaged cereals)

Cheese and cheese by-products

Chocolate and chocolate products (assorted chocolate, chocolate liquor, cocoa, cocoa powder, dark chocolate coating and milk chocolate)

Processed coffee

Corn grits

Cured, dried and processed meat products and dried fish

Dates

Dried eggs and egg yolk solids

Dried milk, dried powdered milk, nondairy creamers, and nonfat dried milk

Dried or dehydrated fruits (apples, dates, figs, peaches, pears, prunes, raisins and sultanas)

Figs

Malt

Peanuts

Processed herbs, spices, seasonings and condiments

Processed nuts (almonds, apricot kernels, Brazil nuts, cashews, filberts, pecans, pistachio nuts and walnuts)

Processed oats (including oatmeal)

Rice, (brewers rice grits, enriched and polished ~~rice~~)

Soybean flour and milled fractions

Processed tea

Dried and dehydrated vegetables (beans, carrots, lentils, peas, potato flour, potato products and spinach)

Yeast (including primary yeast)

c. Animal Feed and Feed Ingredients

d. Nonfood Products

00598
 00599 Animal hide
 00600 Clothing
 00601 Processed or unprocessed cotton, wool and
 other natural fibers or cloth
 00602
 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
 products
 00609 Paper and paper products
 00610 Dried plants and flowers
 00611 Seeds (grass seed, ornamental herbaceous plant seed
 and vegetable seed)
 00612 (515 Straw or hay
 00613
 00614
 00615
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 00617 D. DOSAGE GUIDE
 00618 Since hydrogen phosphide is a mobile gas and will penetrate
 to all parts of the storage structure, dosage must be based
 upon the total volume of the space being fumigated and not
 on the amount of bulk commodity it contains. For example,
 the same amount of Detiaphos(R) is required to treat a
 30,000 bushel silo whether it is full or not. The following
 dosage ranges are allowed for bulk and space fumigations.
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 00632 (PRODUCT PER 1000 CU. FT. PER 1000 BU.
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 00634 PELLETS 200¹ - 1450² 1250¹ - 51810²
 00635 TABLETS 140¹ - 290² 150¹ - 360²
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stored commodities. An example of this is the treatment of grain stored in flat storage in which fumigant cannot be uniformly added to the grain but must be probed or surface applied,

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

RECOMMENDED DOSAGES FOR SEVERAL TYPES OF FUMIGATIONS

TYPE_OF_FUMIGATION	DOSEAGE RANGE		UNIT_OF_VOLUME*
	PELLETS	TABLETS	
1. SPACE (INCLUDING PACKAGED COMMODITIES)			
A. MILLS, WAREHOUSES, ETC.	200- 600	40-120	1000 CU. FT.
B. BAGGED COMMODITIES	300- 600	60-120	1000 CU. FT.
C. DRIED FRUITS, NUTS AND DATES	200- 400	40- 80	1000 CU. FT.
D. STORED TOBACCO	200- 400	40- 80	1000 CU. FT.
2. BULK STORED COMMODITIES			
A. VERTICAL STORAGE	300- 600	60-120	1000 CU. FT.
	400- 750	80-150	1000 BUSHELS
B. TANKS	400- 700	80-140	1000 CU. FT.
	500- 900	100-180	1000 BUSHELS
C. FLAT STORAGE (LOOSE CONSTRUCTION)	500-1450	100-290	1000 CU. FT.
	150-1800	130-360	1000 BUSHELS
D. FARM BINS	700-1450	140-290	1000 CU. FT.
	900-1800	180-360	1000 BUSHELS
E. RAIL CARS	300- 700	60-140	1000 CU. FT.
	400- 900	80-180	1000 BUSHELS
F. BUNKERS, TARRED GROUND STORAGE	300- 700	60-140	1000 CU. FT.
	400- 900	80-180	1000 BUSHELS
G. BARGES	300- 800	60-160	1000 CU. FT.
	400- 750	80-150	1000 BUSHELS
H. SHIPHOLDS	300- 660	60-132	1000 CU. FT.
	400- 836	80-166	1000 BUSHELS

*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

00709 minor compared to sealing. Proper sealing is necessary to
 00710 insure effective control of insects and to protect man and
 00711 other forms of life in adjoining enclosed areas from
 00712 hydrogen phosphide during the fumigation. Proper sealing
 00713 must include the closure of all openings except tiny holes
 00714 or narrow cracks that are very difficult to seal. Maximum
 00715 results however can be achieved if even these are sealed.
 00716 Polyethylene sheeting and masking or duct tape are adequate
 00717 sealing materials. Contact Research Products Company for
 00718 additional information.

00719 F. EXPOSURE GUIDELINES

00720 The following table may be used as a guide in determining
 00721 the minimum length of the exposure period at the indicated
 00722 temperatures.

00723 U	00724 TEMPERATURE TO WHICH 00725 FUMIGANT AND/OR 00726 INSECTS ARE EXPOSED	00727 PELLETS	00728 TABLETS
	00729 Below 40 F	00730 Do Not Fumigate*	00731 Do Not Fumigate*
	00732 40 F - 53 F	00733 8 days(192 hrs.)	00734 10 days(240 hrs.)
	00735 54 F - 59 F	00736 4 days (96 hrs.)	00737 5 days (120 hrs.)
	00738 60 F - 68 F	00739 3 days(72 hrs.)	00740 4 days(96 hrs.)
	00741 Above 68 F	00742 2 days(48 hrs.)	00743 3 days(72 hrs.)

00744 *The only exception to this is cold weather tobacco
 00745 fumigation. See page 11 of this manual for additional
 00746 instructions for this type of fumigation.

00747 The length of the fumigation must be great enough so as to
 00748 provide for adequate control of the insect pests which
 00749 infest the commodity being treated. It is necessary to
 00750 lengthen the fumigation at lower temperatures since insects
 00751 are more difficult to kill under these conditions. In this
 00752 regard, the temperature to which the insects are exposed is
 00753 the critical factor.

00754 There is little to be gained by extending the exposure
 00755 period if the structure to be fumigated has not been
 00756 carefully sealed. Careful sealing is required to ensure
 00757 that adequate gas levels are retained. In fact, it is
 00758 advisable to seal more tightly for magnesium phosphide than
 00759 aluminum phosphide since magnesium phosphide generates the
 00760 gas much more quickly thus allowing more opportunity for
 00761 leakage. Proper application procedures must be followed to
 00762 provide satisfactory distribution of hydrogen phosphide gas
 00763 particularly in the fumigation of bulk commodity contained
 00764 in large storages.

00765 When pellets or tablets are not uniformly added to a bulk
 00766 commodity mass (i.e. surface application or shallow probing)
 00767 exposure times must be substantially lengthened to allow

00764
00765
00766 penetration of gas throughout the commodity. As a "rule of thumb" a minimum of 1 day should be added to the exposure time listed on page for each 10 feet the gas must .
00767 penetrate downward. It is preferable to add 2 days for each
00768 10 feet. Some structures can only be treated when
00769 completely tarped.

00770
00771 In addition the fumigation period should be long enough that
00772 the production of hydrogen phosphide has essentially ceased.
00773 This will minimize worker exposure during further storage
00774 and/or processing of the treated bulk commodity as well as
00775 reduce hazards in the disposal of spent magnesium phosphide
00776 products remaining after space fumigations. Temperature and
00777 humidity to which Detiaphes(R) Pellets and Tablets are
00778 exposed are important to this determination since both lower
00779 temperatures and/or dry air retard gas release. ~~usually~~ usually
00780 ~~not~~ a problem since magnesium phosphide generates
00781 the fumigant gas very quickly!

00782
00783
00784 Consequently, exposure periods recommended in the table are
00785 minimum periods and may not be adequate to control all stored
00786 product pests under all conditions. This is particularly
00787 true at lower temperatures (below 60 degrees F). Nor will
00788 they always provide for the cessation of the production of
00789 hydrogen phosphide when pellets or tablets are exposed to
00790 ~~very~~ moisture levels. Grain at 70 degrees F and 12
00791 percent moisture provides more than adequate conditions for
00792 fumigation.

00793
00794 If the temperature to which the insects are exposed is
00795 warmer than the temperature to which the pellets or tablets
00796 are exposed (i.e. may occur in a winter space fumigation),
00797 it may be possible to obtain an effective insect kill before
00798 the fumigant is totally spent. In this event it is
00799 permissible to conclude a space fumigation as soon as an
00800 effective kill has been achieved, however in this event the
00801 pellets or tablets must be deactivated prior to disposal.
00802 See deactivation instructions on page of this manual.

00803
00804 Whenever possible, exposure periods should exceed minimum
00805 periods listed above. Remember, the key to effective
00806 results lies with correct dosage, long exposure periods,
00807 proper application procedures and well sealed enclosures.

00808

00800 0 0. APPLICATION PROCEDURES

00811 1. GENERAL STATEMENT

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00813 The following instructions are intended to provide
00814 general guidelines for typical fumigations. These
00815 instructions are not intended to cover every type of
00816 situation nor are they meant to be restrictive. Other
00817 procedures may be used if they are safe, effective and
00818 consistent with the properties of magnesium phosphide
00819 products.

00820 2. APPLICATION PROCEDURES FOR DIRECT ADDITION OF PELLETS OR
00821 TABLETS TO BULK COMMODITIES.

00822 a. Commodities: Listed raw agricultural commodities, seeds,
00823 wood chips, animal feed and feed ingredients, and processed
00824 (197 brewers rice, malt and corn grits used in the manufacture
00825 of beer.

00826 b. Storage Structures: Bins, tanks, silos, granaries, flat
00827 storage, bunkers, bulk rail cars, etc.

00828 c. Procedures For Vertical Storage: (concrete upright bins and
00829 other silo type bins that can be quickly transferred)

00830 (198 (1) For best results all cracks and openings with
00831 the exception of fill openings should be closed
00832 or sealed prior to fumigating the bin. To this
00833 end, vents near the bin top connecting adjacent
00834 bins should be sealed prior to the fumigation.
00835 If the bin is entered to seal these openings
00836 after the fumigant has been added, proper
00837 respiratory protection must be worn.

00838 (2) Determine minimum exposure time based on
00839 commodity temperature and moisture. Commodity
00840 moistures of 12.0% are more than adequate to
00841 obtain complete reaction of the fumigant.

00842 (3) Calculate the number of pellets or tablets needed
00843 and the rate at which they must be added based upon the
00844 rate at which the bin will be filled.

00845 (4) Pellets or tablets may be applied by hand or by an
00846 automatic dispenser on the headhouse/gallery belt or
00847 into the fill opening. An automatic dispenser may also
00848 be used to add fumigant into the upleg of the elevator.
00849 Add fumigant in as continuous a manner as possible to
00850 the commodity stream.

00851 (5) Seal the bin deck openings after the application is
00852 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 11 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 listed on page 11 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 11 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.

• Procedures for Bunkers and Other Outdoor Laced 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

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

(3) Dosage

Unless all the large cracks are sealed as described above the dosage recommended should be 180-360 tablets or 900-1800 pellets per 1000 bu. capacity of the space under the plastic tarp.

(4) Additional Application Instructions

Probing tablets or pellets into the grain mass is the recommended method of application. Probe insertions should be scattered evenly over the surface. A rigid PVC pipe, about 5 to 7 feet long and 1 1/4 inch diameter can be used. In this event, use about 20-50 tablets or 100-250 pellets per probe. The fumigant is gradually released into the probe as it is withdrawn from the grain. Releasing all the fumigant into the probe at once may retard the production of hydrogen phosphide and might cause an ignition of gas trapped in the clump of pellets or tablets. Place no more than 1/4 of the total dose in floor level aeration ducts. Be sure the inside of the aeration duct is dry before adding the pellets or tablets. Addition of Detiaphos(R) to water in an aeration duct can cause a fire. Seal the aeration fan as

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described above.

(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.

5/10/83 5/10/83 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 Sealable Enclosures

(1) Determine the dosage of tablets or pellets to be applied based upon the following parameters for space fumigation:

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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 Detiaphos(R) Tablets or Pellets.

(5) Spread Detiaphos(R) on the sheets at a density

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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 Tarpes:

(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

01198 formed from the sheets. The volume of these enclosures
01199 may vary widely.

01200
01201 (2) Sealing

01202 An enclosure suitable for fumigation may be formed by
01203 covering packaged commodities with plastic sheeting.
01204 The sheets may be taped, glued, or clamped together to
01205 provide a sufficient width of material to ensure that
01206 adequate sealing is obtained. If the flooring upon
01207 which the commodity rests is of wood or other porous
01208 material, it should be repositioned onto plastic
01209 sheeting prior to covering for fumigation. The plastic
01210 covering of the pile may be sealed to the floor using
01211 tape, glue, sand or water snakes, by shoveling soil or
01212 sand onto the ends of the plastic covering or by other
01213 suitable procedures. The plastic covering should be
01214 reinforced by tape or other means around any sharp
01215 corners or edges in the stack so as to reduce the risk
01216 of tearing. Thinner sheeting, about 2 mils, is
01217 suitable for most indoor tarp fumigations. However, 4
01218 mil plastic or thicker is more suitable for outdoor
01219 applications where wind or other mechanical stresses
01220 are likely to be encountered.

01221 (3) Additional Application Instructions

01222 Tablets or pellets may be applied under the edge
01223 of the tarp or through slits. The pellets or
01224 tablets should be protected from condensation or
01225 other source of water. The slits in the
01226 covering should be carefully taped to prevent
01227 loss of gas once the dose has been applied.
01228 Pellets or tablets must be placed in a single
01229 layer. Care should be taken to prevent the
01230 plastic tarp from covering the pellets or
01231 tablets in such a way as to prevent contact with
01232 moist air or to confine the gas. Refer to other
01233 sections for dosage and exposure times.

01234 (4) Additional Precautions

01235 See appropriate precautions if the fumigation is
01236 conducted indoors as opposed to outdoors.
01237 Indoor fumigation precautions are handled as any
01238 other situation where the application is made
01239 from outside the area being fumigated (i.e. the
01240 adding of pellets or tablets to a dispenser for
01241 uniform addition to grain). Workers may occupy
01242 adjacent indoor areas but they must be protected
01243 from overexposure to hydrogen phosphide by
01244 adequate sealing, ventilation or as a last
01245 resort, respiratory equipment.

01246 Do not walk on stacks during the fumigation.

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01252 Place "DANGER" placards at conspicuous points on the
01253 enclosure.

01254 Follow precautions listed elsewhere in labeling.

01255 (5) Aeration

01256 Precautions must be taken to assure that
01257 exposure to hydrogen phosphide in excess of
01258 allowed limits does not occur both during the
01259 fumigation and aeration.

01260 4. APPLICATION PROCEDURES FOR INTRANSIT FUMIGATION OF SHIP
01261 HOLDS

01262 a. General Information:

01263 (1) Shipboard fumigation is also regulated by the U.S.
01264 Coast Guard Regulations 46 CFR 147A.

01265 (2) This product is toxic to fish. Keep out of Lakes,
01266 streams and other aquatic environments. Do not
01267 contaminate water by cleaning equipment or disposal of
01268 wastes.

01269 b. Pre-Voyage Fumigation Procedures and Precautions:

01270 (1) Refer to and comply with the regulations and
01271 procedures found in U.S. Coast Guard Regulation, 46 CFR
01272 147A.

01273 (2) Prior to fumigating a vessel for intransit cargo
01274 fumigation, the master of the vessel or his
01275 representative, and the fumigator must determine
01276 whether the vessel is suitably designed and configured
01277 so as to allow for safe occupancy by the ship's crew
01278 throughout the duration of the fumigation/voyage.

01279 If it is determined that the design and
01280 configuration of the vessel does not allow for
01281 safe occupancy by the ship's crew throughout the
01282 duration of the fumigation/voyage, then the
01283 vessel will not be fumigated unless all crew
01284 members are removed from the vessel. The crew
01285 members will not be allowed to re-occupy the
01286 vessel until the vessel has been properly
01287 aerated and a determination has been made by the
01288 master of the vessel and the fumigator that the
01289 vessel is safe for occupancy.

01290 (3) The person responsible for the fumigation must
01291 notify the master of the vessel, or his representative
01292 of the requirements relating to personal protection
01293 equipment*, low range detection equipment and that a

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person qualified in the use of this equipment must accompany the vessel with cargo under fumigation. Emergency procedures, cargo ventilation, periodic monitoring and inspections, and first aid measures must be discussed with and understood by the master of the vessel or his representative.

- (4) Seal all openings to the cargo hold or tank using suitable, water proof, gas tight materials. Lock and/or otherwise secure all openings, manways, etc. used to enter the hold. Post appropriate "DANGER" placards on same.
- (5) On tankers the over-space pressure relief system of each tank must be sealed by (1) the closing of appropriate valves and (2) sealing the openings into the over-space with gas tight materials.
- (6) Contact appropriate authorities.
- (7) If the fumigation is not completed and the vessel aerated before the manned vessel leaves port, the person in charge of the vessel shall insure that at least two units of personal protection equipment and one gas or vapor detection device and a person qualified in their operation be on board the vessel during the voyage.
- (8) During the fumigation or until a manned vessel leaves port or the cargo is aerated, the person in charge of the fumigation shall insure that a qualified person using gas or vapor detection equipment test spaces adjacent to the fumigated cargo area and all regularly occupied spaces for fumigant leakage. If leakage of the fumigant is detected, the person in charge of the fumigation shall take action to correct the leakage or shall inform the master of the vessel or his representative, of the leakage so that corrective action can be taken.
- (9) Review with the Master, or his representative, the voyage precautions and procedures.

*Personal protection equipment means a respirator or gas mask fitted with a canister designed for phosphine gas which is approved by NIOSH/MSHA. A gas mask and canister is approved for use up to 15 ppm. Above 15 ppm or at unknown concentrations a SCBA or its equivalent must be used.

01363 U c. Procedures for Bulk Dry Cargo Vessels and Tankers:

01364 (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.

01365 (2) Close and secure hatch covers, tank tops, butterworths, etc. immediately following application.

01366 d. Voyage Precautions and Procedures:

01367 (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.

01368 Special attention should be given to living quarters, 01369 kitchens, storerooms, mess halls, keel ducts, day 01370 rooms, the bridge, engine room and any other enclosed 01371 spaces occupied or frequented by crew members during a 01372 voyage.

01373 (2) If hydrogen phosphide is detected, evacuate the space 01374 or area, locate and seal off the source of the leak 01375 wearing appropriate respiratory protection equipment. 01376 Ventilate the area before allowing occupants to 01377 return.

01378 (3) Do not enter fumigated holds or tanks.

01379 (4) Do not open, ventilate or aerate the fumigated 01380 holds during the voyage.

01381 e. Precautions and Procedures During Discharge:

01382 If necessary to enter holds prior to discharge, test spaces 01383 directly above cargo surface for fumigant concentration, 01384 using appropriate gas detection and personal protection 01385 equipment. Do not allow entry to fumigated areas without 01386 personal protection equipment, unless fumigant 01387 concentrations are at safe levels, as indicated by a 01388 suitable detector.

01389 f. Personal Protective Equipment and Monitoring:

01390 (1) Fully loaded holds on dry bulk carriers are 01391 considered an outdoor fumigation.

01392 (2) Tanker holds which must be entered to fumigate and 01393 partially loaded holds on dry bulk carriers are 01394 fumigated from within the area being treated.

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(3) See sections "I" and "M" on pages of this manual for requirements.

(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.

5. APPLICATION PROCEDURES FOR INTRANSIT FUMIGATION OF CONTAINERS ON SHIPS

- 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)".
- b. When fumigating a commodity by direct addition of pellets or tablets, refer to Section "2.f." on page of this manual.
- 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.
- d. Comply with general precautions given in labeling.

6. APPLICATION PROCEDURES FOR FUMIGATION OF BARGES

- 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 .
- 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
 - U.S. Coast Guard
 - Hazardous Materials Branch
 - Washington, D.C. 20593-0001
- b. Sealing
Special care must be taken in determining whether a barge

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is suitable for fumigation. Excessive leakage may occur through poorly sealed hold covers.

7. APPLICATION PROCEDURES FOR FUMIGATION OF RODENT AND MOLE BURROWS

a. List of Borrowing Basis

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 2¹ to 8¹ Detiaphos(R) Tablets or 10¹ to 40¹ 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 14¹ to 8¹ tablets or 20¹ to 40¹ 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.

Ietiaphos(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.

E: 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 Petri dishes (B) in a manner that may kill or

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otherwise harm an endangered or threatened species or adversely modify their habitat is a violation of federal law. The use of this product is controlled to prevent death or harm to endangered or threatened species that occur in the following counties or elsewhere in their range. Use of this product in the areas listed below is prohibited without first contacting and obtaining permission from the Endangered Species Specialist at the nearest regional offices of the U. S. Fish and Wildlife Service (FWS).

Areas Inhabited by Endangered or Threatened Species

- (1) Black-footed ferret - State of Arizona, Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah and Wyoming.
- (2) Blunt-nosed leopard lizard - Counties of Kern, Kings, Fresno, Madera, Merced, and Tulare in the state of California.
- (3) Desert tortoise - Washington county in the state of Utah.
- (4) Eastern indigo snake - States of Florida and Georgia.
- (5) San Joaquin kit fox - Counties of Kern, Kings, Fresno, Merced, Monterey, San Benito, San Luis Obispo, Santa Barbara, Tulare and Ventura in the state of California.

e. Special Local Restrictions

(1) NORTH CAROLINA

Detiaphos(R) Tablets and Pellets may only be used for control of rats and mice in the state of North Carolina. Use against other pests is not permitted.

(2) OKLAHOMA

A special permit for black-tailed prairie dog control by poisoning is required in Oklahoma. Contact the Oklahoma State Department of Wildlife Conservation to obtain this permit.

(3) WISCONSIN

A state permit is required for use of pesticides in Wisconsin to control small mammals, except rats or mice. Please contact your local Department of Natural Resources office for information.

(4) INDIANA

Use of Detiaphos(R) Tablets or Pellets for mole control is not legal in the state of Indiana.

(5) MISSOURI

A state permit is required for use of pesticides in Missouri to control small mammals, except rats and mice. Please contact the Missouri Department of Conservation office for information.

(6) KANSAS

A special permit for black-tailed prairie dog control by poisoning is required in Kansas. Contact the Kansas Fish and Game Commission to obtain this permit.

(7) CALIFORNIA

Use of Detriaphos(R) Tablets and Pellets for chipmunk control is not legal in the state of California.

9. APPLICATION PROCEDURES FOR FUMIGATION OF BEEHIVES, SUPERS AND OTHER BEEKEEPING EQUIPMENT

Detiaphos(R) Tablets and Pellets may be used for the control of the greater wax moth in stored beehives, supers and other beekeeping equipment and for the destruction of bees, Africanized bees, and diseased bees including those infested with tracheal mites and foulbrood. The recommended dosage for this use is 60-90 tablets or 300-450 pellets per 1000 cu. ft.

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

9. COLD WEATHER TOBACCO FUMIGATION

Although 40 F is the lowest temperature allowed for fumigating most commodities, an effective tobacco fumigation can be achieved at 50 F. This temperature is the temperature to which the pellets or tablets are exposed, not the outdoor temperature. The fumigation should last at least 96 hours prior to aeration. Since this is a shorter exposure period than normally used at cold temperatures, extra care should be taken to assure the fumigant is spent prior to disposal. The wet or dry method of deactivation may be used, however, when using the dry method the dust must not be accumulated so as to contain the gas being released. The wet method of deactivation is recommended.

01639 Q H. PROTECTIVE CLOTHING

01641 Wear dry gloves made of cotton or other material when
01642 contact with tablets, pellets, or their dust is likely.
01643 Wash hands after use.

01644

01645 I. RESPIRATORY PROTECTION

01646 1. WHEN RESPIRATORY PROTECTION MUST BE WORN

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01648 NIOSH/MSHA approved respiratory protection must be worn
01649 during exposure to concentrations in excess of permitted
01650 limits or when concentrations are unknown.

01651

01652 2. PERMISSIBLE GAS CONCENTRATION RANGES FOR RESPIRATORY
01653 PROTECTION DEVICES

01654

01655 A NIOSH/MSHA approved, full face gas mask - hydrogen
01656 phosphide canister combination may be used at levels up
01657 to 15 ppm or to escape from levels up to 1500 ppm.
01658 Above this level or in situations where the hydrogen
01659 phosphide concentration is unknown, a NIOSH/MSHA
01660 approved, self-contained breathing apparatus (SCBA) or
01661 its equivalent must be used. The NIOSH/OSHA Pocket
01662 Guide, B-88, DHEW/NIOSH 78-210, lists these and other
01663 types of approved respirators and the concentration
01664 limits of which they may be used.

01665

01666 3. REQUIREMENTS FOR AVAILABILITY OF RESPIRATORY PROTECTION

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01668 Respiratory protection must be available at the site of
01669 application in case it is needed when applying
01670 Detiaphos(R) from within the structure being fumigated.
01671 An approved full face gas mask - phosphine canister
01672 combination or self-contained breathing apparatus (SCBA)
01673 or its equivalent must be available at the site of
01674 application. If SCBA or its equivalent is not available
01675 at the application site, it must be available locally,
01676 for example, at a fire station or rescue squad.

01677

01678 Respiratory protection need not be available for
01679 applications from outside the area to be fumigated such
01680 as addition of tablets or pellets to automatic
01681 dispensing devices, etc., if exposures above the
01682 permitted exposure limit will not be encountered.

01683

01684 Respiratory protection need not be available for outdoor
01685 applications.

01686

01687 If respiratory equipment is not available on a farm, the
01688 application must be done from outside the structure.

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01690 J. PLACARDING OF FUMIGATED AREAS

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01692 The applicator must placard or post all entrances to the
01693 fumigated area with signs bearing:

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1. The signal word "DANGER/PELIGRO" and the SKULL and CROSSBONES symbol in red.
2. The statement, "Area and/or commodity under fumigation, DO NOT ENTER/NO ENTRE".
3. The statement "This sign may only be removed after the commodity is completely aerated (contains 0.3 ppm or less 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.

commodity

Do not remove a placard until the treated ~~area~~ 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

01748
01749 trace amounts on up. Use instructions are enclosed with
01750 each purchase. Consult your local supplier of such
01751 equipment or contact Research Products Company for more
01752 information.

01753 L. AERATION OF FUMIGATED COMMODITIES

01754 1. FOODS AND FEEDS

01755 Tolerances for hydrogen phosphide residues have been
01756 established at 0.1 ppm for animal feeds and 0.01 ppm for
01757 finished foods. To guarantee compliance with these
01758 tolerances, it is necessary to aerate these commodities
01759 for 48 hours prior to offering them to the end
01760 consumer.

01761 2. TOBACCO

01762 Tobacco must be aerated for at least three days (72
01763 hours) when fumigated in hogsheads and for at least two
01764 days (48 hours) when fumigated in other containers.
01765 When plastic liners are used, longer aeration periods
01766 will probably be required to aerate the commodity down
01767 to 0.3 ppm.

01768 3. As an alternative to these aeration periods, each
01769 container of a treated commodity may be analyzed for
01770 residues using accepted analytical methods. If residues
01771 are less than tolerance levels, the commodity may be
01772 shipped to the consumer regardless of the above holding
01773 periods.

01774 M. APPLICATOR AND WORKER EXPOSURE

01775 1. HYDROGEN PHOSPHIDE EXPOSURE LIMITS

01776 Exposure to hydrogen phosphide must not exceed the 8
01777 hour TWA of 0.3 ppm for applicators and workers during
01778 application. Application is defined as the time period
01779 covering the opening of the first container, applying
01780 the appropriate dosage of fumigant and closing up the
01781 site to be fumigated. All persons in the treated site
01782 and in adjacent indoor areas are covered by this
01783 exposure standard.

01784 After application is completed worker or applicator
01785 exposure must not exceed 0.3 ppm maximum concentration.
01786 Such exposures may occur because of leakage into
01787 enclosed areas from fumigation sites, during reentry or
01788 during transfer of unaged commodity.

01789 2. APPLICATION OF FUMIGANT

01790 Depending upon temperature and humidity, Detiaphos(R)
01791 Tablets and Pellets release hydrogen phosphide gas upon
01792 exposure to moisture from the air. This release is
01793 sometimes slow enough to permit applicators to deposit
01794 fumigant in the desired areas and then vacate the
01795 premises without significant exposure to the gas. If

01802 the fumigator's exposure exceeds the 8 hour TWA of 0.3
01803 ppm, approved respiratory protection must be worn. Gas
01804 concentration measurements for safety purposes must be
01805 made using low level detector tubes or other suitable
01806 low level detection equipment. See the "Industrial
01807 Hygiene Monitoring" section below. Information on
01808 hydrogen phosphide (phosphine, PH₃) detector tubes may
01809 be obtained from Research Products Company.

01810
01811 It is usually advisable to wear approved respiratory
01812 protection from start to finish. This is particularly
01813 true when performing large space fumigations or when
01814 fumigating bulk stored commodities in flat storage
01815 buildings.

01816
01817 3. LEAKAGE FROM FUMIGATED SITES

01818 Hydrogen phosphide is highly mobile and given enough
01819 time may penetrate seemingly gas tight materials such as
01820 concrete and cinder block. Therefore, adjacent,
01821 enclosed areas likely to be occupied should be examined
01822 to ensure that significant leakage has not occurred.
01823 Sealing of the fumigated site and/or air flow in the
01824 occupied areas should be used to reduce exposure.

01825
01826 4. AERATION AND REENTRY

01827 If the area is to be entered after fumigation, it must
01828 be aerated until the level of hydrogen phosphide gas is
01829 0.3 ppm or below. The area or site must be monitored to
01830 ensure that liberation of gas from the treated commodity
01831 does not result in the development of unacceptable
01832 levels of hydrogen phosphide. Do not allow reentry into
01833 treated areas by any person before this time unless
01834 protected by an approved respirator.

01835
01836 5. HANDLING UNAERATED COMMODITIES

01837 Transfer and processing of a treated commodity prior to
01838 complete aeration is permissible, however workers must
01839 not be exposed to hydrogen phosphide in excess of the
01840 permitted exposure limits.

01841
01842 6. INDUSTRIAL HYGIENE MONITORING

01843 It is recommended that hydrogen phosphide exposure be
01844 documented in an operation log or manual for each site
01845 and operation where exposure may occur. The purpose of
01846 this monitoring is to prevent excessive exposure and to
01847 determine when and where respiratory protection is
01848 required. This monitoring is mandatory although once
01849 exposures have been adequately characterized, subsequent
01850 monitoring is not routinely required. However, spot
01851 checks should be made occasionally, especially if ~~creosolic~~
01852 ~~unperfected~~
01853 conditions significantly change. Gas concentration ~~odor is~~
01854 measurements should be taken in the worker's breathing ~~detected~~
01855 zone. Monitoring is not required outdoors.

01856
01857 7. ENGINEERING CONTROLS AND WORK PRACTICES

01858 If initial monitoring shows that workers are exposed to
01859 concentrations in excess of the permitted exposure
01860 limits then engineering controls (such as forced air
01861 ventilation) and/or appropriate work practices should be
01862 used where possible in an attempt to reduce exposure to
01863 below permitted limits.

01864
01865 N. STORAGE AND DISPOSAL

01866 1. STORAGE

01867 Flasks should be stored in a dry, well ventilated area,
01868 away from heat and under lock and key. Post as a
01869 pesticide storage area. Do not contaminate water, food
01870 or feed by storing pesticides in the same areas used to
01871 store these commodities. Do not store in buildings
01872 where humans or domestic animals reside. Keep out of
01873 reach of children.

01874 Detiaphos(R) Tablets and Pellets are supplied in gas
01875 tight resealable, aluminum flasks. Do not expose the
01876 product inside flasks to atmospheric moisture any longer
01877 than is necessary. Seal tightly before returning opened
01878 flasks to storage. The shelf life of Detiaphos(R) is
01879 virtually unlimited if the containers are tightly
01880 sealed.

01881 Flasks should not be stored at sub-zero temperatures
01882 because this will increase the possibility of an
01883 ignition (flash) when opened.

01884 2. DISPOSAL OF UNREACTED OR PARTIALLY REACTED TABLETS OR
01885 PELLETS

01886 (From spills, leaking flasks or other sources) Unreacted
01887 or partially reacted Detiaphos(R) Pellets or
01888 Detiaphos(R) Tablets are acutely hazardous. Improper
01889 disposal of these products is a violation of federal
01890 law. If these products cannot be disposed of by
01891 ordinary use or according to the instructions that
01892 follow, contact your state pesticide or environmental
01893 control agency or the hazardous waste representative at
01894 the nearest EPA regional office for guidance. Do not
01895 contaminate water by disposal.

01896 Some local and state waste disposal regulations may vary
01897 from the following recommendations. Disposal procedures
01898 should be reviewed with appropriate authorities to
01899 ensure compliance with local regulations.

01900 FOR SPECIFIC INSTRUCTIONS SEE "SPILL AND LEAK
01901 PROCEDURES" ON PAGE OF THIS MANUAL.

01902
01903 3. DISPOSAL OF PELLET OR TABLET DUST FOLLOWING A SPILL

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01913 U

FUMIGATION

a. General

If properly exposed, the residual dust remaining after a fumigation with Detiaphos(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.

All cars
or under
lined.

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.

01947 11

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 Detiaphos(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, state and local authorities.

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0. SPILL AND LEAK PROCEDURES

1. GENERAL

A spill other than incidental to application or normal handling, can produce high levels of gas and, therefore

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 24 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.

or punctured flasks,

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02032 attending personnel must wear a SCBA or its equivalent
02033 when the concentrations of hydrogen phosphide gas is
02034 unknown. If the concentration is known, other
02035 NIOSH/MSHA approved respiratory protection can be worn.
02036 Wear dry cotton or other gloves when handling spilled
02037 material.

02038 2. DAMAGE TO FIBERBOARD CASE

02039 Check aluminum flasks. If they are damaged handle as
02040 described below. If they are undamaged return them to
02041 cardboard cartons or other suitable packaging which
02042 complies with DOT regulations.

02043 3. LEAKING FLASK PROCEDURES

02044 If aluminum flasks have been punctured or damaged
02045 causing a leak, the product may be immediately used, the
02046 container may be temporarily repaired with aluminum tape
02047 or the Detiaphos(R) may be transferred from the damaged
02048 flask to a sound metal container which should be sealed
02049 and properly labeled as magnesium phosphide. Transport
02050 the damaged containers to an area suitable for pesticide
02051 storage for inspection. Further instructions and
02052 recommendations may be obtained, if required, from
02053 Research Products Company.

02054 Handle empty damaged containers as described under
02055 "DISPOSAL OF EMPTY FLASKS" above.

02056 4. SPILL PROCEDURES

02057 Do not flush spillage down drain with water. DO NOT
02058 use water at anytime to clean up a spill. Water in
02059 contact with unreacted tablets or pellets will rapidly
02060 accelerate the production of hydrogen phosphide gas and
02061 could cause spontaneous ignition of the gas. If the
02062 spill is only a few minutes old and is not contaminated
02063 by other materials, collect the spillage and place it
02064 back into the original flask or other sound metal
02065 container and tighten the cap. If possible, use
02066 immediately. CAUTION: AN IGNITION MAY OCCUR WHEN THESE
02067 CONTAINERS ARE REOPENED.

02068 If the spilled material is contaminated or has begun to
02069 visibly decompose, gather it up and place it into open
02070 top, perforated silicon cans and process it immediately.

02071 Do not add more than about one flask (2 to 3 lbs.) of
02072 spilled material to the bucket. If on-site
02073 deactivation is not feasible, these open containers
02074 should be transported in open vehicles to a suitable
02075 area away from occupied buildings. Wet or dry
02076 deactivation may then be carried out as described in the
02077 section immediately below.

02080 U 5. DEACTIVATION AND DISPOSAL OF UNREACTIONED OR PARTIALLY REACTED TABLETS OR PELLETS

02081

02082 U a. Wet Method

02083 Transport material by hand or in open vehicles to open air away from occupied structures. Fill a drum 2/3 full with water.

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02088 Detergent need not be used for magnesium phosphide.

02089 Each flask of tablets or pellets should be mixed

02090 with no less than 1 gallon of water. Partially

02091 spent pellets or tablets may react quite vigorously

02092 during wet deactivation if they were exposed under

02093 cold and/or dry conditions or if the fumigation

02094 period was shortened. It is suggested that a small

02095 portion of the product be tested prior to immersing

02096 large amounts of material in water if it is

02097 suspected that the product contains considerable

02098 unreacted magnesium phosphide. Due to the

02099 reactivity of magnesium phosphide, additions to the

02100 water should be made slowly and carefully. Allow

02101 the mixture to stand with occasional stirring. Stir

02102 occasionally thereafter for at least 4 hours. Wear

02103 appropriate respiratory protection. DO NOT COVER

02104 THE CONTAINER. IF THE CONTAINER IS COVERED THE

02105 HYDROGEN PHOSPHIDE BEING GENERATED WILL BE CONFINED

02106 AND WILL DECOMPOSE EXPLOSIVELY. The wet method of

02107 deactivation is the method of choice for quantities

02108 in excess of 5 flasks (10 to 15 pounds). It is safe

02109 to dispose of this slurry.

02110

02111 Dispose of the resulting deactivated slurry, with or

02112 without preliminary pouring out of excess water, at

02113 a sanitary landfill or other suitable burial site

02114 approved by local authorities. Where permissible

02115 this slurry may be poured into a storm sewer or out

02116 onto the ground.

02117

02118 U b. Dry Method

02119 As an alternative to the wet method, when

02120 permissible small amounts (up to 5 flasks) of

02121 partially reacted or unreacted material may be

02122 spread out in an open, secure area away from

02123 occupied buildings to be deactivated by atmospheric

02124 moisture.

02125

02126

02127 NOTE! Never place pellets, tablets, their dust or

02128 the dust/water slurry in a confined container such

02129 as a closed drum or plastic bags. Any hydrogen

02130 phosphide generated will be confined and may

02131 decompose explosively.

02132

ACCEPTED
with COMMENTS
in EPA Letter Dated:

MAR 16 1987

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

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INSTRUCTIONS
FOR INTRANSIT
FUMIGATION OF
SHIP HOLDS
WITH
Detiaphos(R)
PELLETS
AND
TABLETS

RESTRICTED USE PESTICIDE
DUE TO ACUTE INHALATION TOXICITY OF HIGHLY
TOXIC HYDROGEN PHOSPHIDE (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 attached 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.

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

01950 P

02000 U a. Introduction

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02150 Detiaphos(R) Tablets and Detiaphos(R) Pellets are fumigant
02200 preparations containing 34% magnesium phosphide (by
02250 weight) which when removed from their original shipping
02300 containers will liberate hydrogen phosphide (phosphine).
02350 The reaction between atmospheric moisture and magnesium
02400 phosphide which produces hydrogen phosphide will continue
02450 for several days depending on temperature and humidity to
02500 which the preparation is exposed. To be effective the cargo
02550 holds or tanks should remain sealed for the duration of the
02600 voyage.

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02700 U b. General Information

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(1) Shipboard fumigation is also regulated by the U. S.
02900 Coast Guard regulations 46 CFR 147A.

02950

(2) Detiaphos(R) Tablets (EPA Reg. No. 2548-68) and
03000 Detiaphos(R) Pellets (EPA Reg. No. 2548-67) are
03050 classified by the U. S. Environmental Protection Agency
03100 as RESTRICTED USE PESTICIDES, DUE TO ACUTE INHALATION
03150 TOXICITY OF HIGHLY TOXIC HYDROGEN PHOSPHIDE (PHOSPHINE,
03200 PH₃) GAS. For retail sale to and use only by certified
03250 applicators for those uses covered by the applicator's
03300 certification or persons trained in accordance with the
03350 attached product manual working under the direct
03400 supervision and in the physical presence of the
03450 certified applicator. Physical presence means on site
03500 or on the premises. Read and follow the label and the
03550 Research Products Company product manual which contains
03600 complete instructions for the safe use of this
03650 pesticide.

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04250 U c. Pre-Voyage Fumigation Procedures and Precautions:

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(1) Refer to and comply with the regulations and procedures
04400 found in U. S. Coast Guard regulation, 46 CFR 147A.

(2) Prior to fumigating a vessel for intransit cargo
04450 fumigation, the master of the vessel or his
04500 representative, and the fumigator must determine whether
04550 the vessel is suitably designed and configured so as to

04800 allow for safe occupancy by the ship's crew throughout
 04850 the duration of the fumigation/voyage.

04900
 04950 If it is determined that the design and configuration of the
 05000 vessel does not allow for safe occupancy by the ship's
 05050 crew throughout the duration of the fumigation/voyage,
 05100 then the vessel will not be fumigated unless all crew
 05150 members are removed from the vessel. The crew members
 05200 will not be allowed to re-occupy the vessel until the
 05250 vessel has been properly aerated and a determination has
 05300 been made by the master of the vessel and the fumigator
 05350 that the vessel is safe for occupancy.
 05400

05450 (3) The person responsible for the fumigation must notify
 05500 the master of the vessel, or his representative, of the
 05550 requirements relating to personal protection equipment*,
 05600 low range detection equipment and that a person
 05650 qualified in the use of this equipment must accompany
 05700 the vessel with cargo under fumigation. Emergency
 05750 procedures, cargo ventilation, periodic monitoring and
 05800 inspections, and first aid measures must be discussed
 05850 with and understood by the master of the vessel or his
 05900 representative.

05950 (4) Seal all openings to the cargo hold or tank using
 06000 suitable, water proof, gas tight materials. Lock and/or
 06050 otherwise secure all openings, manways, etc. used to
 06100 enter the hold. Post appropriate "DANGER" placards on
 06150 same.

06200 (5) On tankers the over-space pressure relief system of each
 06250 tank must be sealed by (1) the closing of appropriate
 06300 valves and (2) sealing the openings into the over-space
 06350 with gas tight materials.

06400 (6) Contact appropriate authorities.

06450 (7) If the fumigation is not completed and the vessel
 06500 aerated before the manned vessel leaves port, the person
 06550 in charge of the vessel shall insure that at least two
 06600 units of personal protection equipment and one gas or
 06650 vapor detection device and a person qualified in their
 06700 operation be on board the vessel during the voyage.

06750 (8) During the fumigation or until a manned vessel leaves
 06800 port or the cargo is aerated, the person in charge of
 06850 the fumigation shall insure that a qualified person, using
 06900 gas or vapor detection equipment test spaces adjacent
 06950 to the fumigated cargo area and regularly occupied
 07000 spaces for fumigant leakage.

07050 If leakage of the fumigant is detected, the person in charge
 07100 of the fumigation shall take action to correct the
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07500 leakage or shall inform the master of the vessel or his
 07550 representative, of the leakage so that corrective
 07600 action can be taken.

07650
 07700 (9) Review with the master, or his representative, the
 07750 voyage precautions and procedures.

07800
 07850 *Personal protection equipment means a respirator or gas
 07900 mask fitted with a canister designed for phosphine gas
 07950 which is approved by NIOSH/MSHA. A gas mask and
 08000 canister is approved for use up to 15 ppm. Above 15 ppm
 08050 or at unknown concentrations a SCBA or its equivalent
 08100 must be used.

08150
 08200 U d. Usage_Guide

08250	08300	08350	08400	08450	08500	08550	08600	08650	08700	08750	08800	08850	08900	08950	09000	09050	09100	09150	09200	09250	09300	09350	09400	09450	09500	09550	09600	09650	09700	09750	09800	09850	09900	09950	10000	10050	10100	10150	10200	10250	10300
		08350	08400	08450	08500	08550	08600	08650	08700	08750	08800	08850	08900	08950	09000	09050	09100	09150	09200	09250	09300	09350	09400	09450	09500	09550	09600	09650	09700	09750	09800	09850	09900	09950	10000	10050	10100	10150	10200	10250	10300

08650 *Volume or storage capacity of the area being treated.

08700
 08750 U e. Procedures_for_Bulk_Dry_Cargo_Vessels_and_Tankers:

08800
 08850
 08900 (1) Apply either the tablets or pellets by scattering them
 08950 uniformly onto the commodity surface utilizing as much
 09000 of the total surface area as possible, or insert them
 09050 uniformly into the commodity mass by hand or with probes
 09100 to any depth desired.

09150
 09200 (2) Close and secure hatch covers, tank tops, butterworths,
 09250 etc. immediately following application.

09300
 09350 U f. Voyage_Precautions_and_Procedures:

09400
 09450 (1) At regular intervals monitor spaces adjacent to areas
 09500 containing fumigated cargo and all regularly occupied areas
 09550 for fumigant leakage using appropriate gas detection
 09600 equipment.

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 09700
 09750 Special attention should be given to living quarters,
 09800 kitchens, storerooms, mess halls, keel ducts, day rooms,
 09850 the bridge, engine room and any other enclosed spaces
 09900 occupied or frequented by crew members during a voyage.

09950
 10000 (2) If hydrogen phosphide is detected, evacuate the space or
 10050 area, locate and seal off the source of the leak wearing
 10100 appropriate respiratory protection equipment. Ventilate
 10150 the area before allowing occupants to return.

10200
 10250 (3) Do not enter fumigated holds or tanks.

10400 (4) Do not open, ventilate or aerate the fumigated holds during
10450 the voyage.

10500
10550 10600 U.g. Precautions_and_Procedures_During_Discharge:

10650
10700 If necessary to enter holds prior to discharge, test spaces
10750 directly above cargo surface for fumigant concentration,
10800 using appropriate gas detection and personal protection
10850 equipment. Do not allow entry into fumigated areas without
10900 personal protection equipment, unless fumigant
10950 concentrations are at safe levels, as indicated by a
11000 suitable detector.

11050
11100 U.h. Personal_Protective_Equipment_and_Monitoring:

11150 (1) Fully loaded holds on dry bulk carriers are considered
11200 an outdoor fumigation.

11250 (2) Tanker holds which must be entered to fumigate and
11300 partially loaded holds on dry bulk carriers are
11350 fumigated from within the area being treated.

11400 (3) See sections "I" and "M" on pages of the manual
11450 titled "Application Procedures for Detiaphos(R) Pellets
11500 and Detiaphos(R) Tablets" for requirements.

11550 (4) If hydrogen phosphide is detected a minimum of two
11600 qualified persons on ship should wear the gas mask and
11650 canister described above while aerating the area and
11700 locating and sealing the leak.

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11800 (00

11850 Research Products Company
11900 Div. of McShares, Inc.
11950 P. O. Box 1460
12000 Salina, Kansas 67402-1460
12050 (913) 825-2181
12100 Telex 417318 REPCO SAL

ACCEPTED
with COMMENTS
in EPA Letter Dated:

MAR 1 6 1987

Under the Federal Insecticide,
Fungicide, and Rodenticide Act
as amended, for the pesticide
registered under EPA Reg. Nos
2548-1Q and 2548-63

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INSTRUCTIONS
FOR INTRANSIT
FUMIGATION OF
SHIP HODS
WITH
NETIA(R)
PELLETS
AND
TABLETS

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 attached 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.

EPA Establishment No. 33982WG01
EPA Registration No. 2548-63
EPA Registration No. 2548-62

01950 P

02050 U a. Introduction

02100 Detia(R) Tablets and Detia(R) Pellets are fumigant
02150 preparations containing 57% aluminum phosphide (by weight)
02200 which when removed from their original shipping containers
02250 will liberate hydrogen phosphide (phosphine). The reaction
02300 between atmospheric moisture and aluminum phosphide which
02350 produces hydrogen phosphide will continue for several days
02400 depending on temperature and humidity to which the
02450 preparation is exposed. To be effective the cargo holds or
02500 tanks should remain sealed for the duration of the voyage.
02550

02600 U b. General Information

02750 (1) Shipboard fumigation is also regulated by the U. S.
02800 Coast Guard regulations 46 CFR 147A.
02850
02950 (2) Detia(R) Tablets (EPA Reg. No. 2548-62) and Detia(R)
03000 Pellets (EPA Reg. No. 2548-63) are classified by the U.
03050 S. Environmental Protection Agency as RESTRICTED USE
03100 PESTICIDES, DUE TO ACUTE INHALATION TOXICITY OF HIGHLY
03150 TOXIC HYDROGEN PHOSPHIDE (PHOSPHINE, PH₃) GAS. For
03200 retail sale to and use only by certified applicators for
03250 those uses covered by the applicator's certification or
03300 persons trained in accordance with the attached product
03350 manual working under the direct supervision and in the
03400 physical presence of the certified applicator. Physical
03450 presence means on site or on the premises. Read and
03500 follow the label and the Research Products Company
03550 product manual which contains complete instructions for
03600 the safe use of this pesticide.
03650
03700 (3) This product is toxic to fish. Keep out of lakes,
03750 streams and other aquatic environments. Do not
03800 contaminate water by cleaning equipment or disposal of
03850 wastes.
03900
03950 (4) For additional information refer to product labels and
04000 the booklet entitled "APPLICATION PROCEDURES FOR
04050 DETIA(R) PELLETS AND DETIA(R) TABLETS".

04100 U c. Pre-Voyage Fumigation Procedures and Precautions

04250
04300 (1) Refer to and comply with the regulations and procedures
04350 found in U. S. Coast Guard regulation, 46 CFR 147A.
04400
04450 (2) Prior to fumigating a vessel for intransit cargo
04500 fumigation, the master of the vessel or his
04550 representative, and the fumigator must determine whether
04600 the vessel is suitably designed and configured so as to
04650 allow for safe occupancy by the ship's crew throughout
04700 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.

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

(4) Seal all openings to the cargo hold or tank using suitable, water proof, gas tight materials. Lock and/or otherwise secure all openings, manways, etc. used to enter the hold. Post appropriate "DANGER" placards on same.

(5) On tankers the over-space pressure relief system of each tank must be sealed by (1) the closing of appropriate valves and (2) sealing the openings into the over-space with gas tight materials.

(6) Contact appropriate authorities.

(7) If the fumigation is not completed and the vessel aerated before the manned vessel leaves port, the person in charge of the vessel shall insure that at least two units of personal protection equipment and one gas or vapor detection device and a person qualified in their operation be on board the vessel during the voyage.

(8) During the fumigation or until a manned vessel leaves port or the cargo is aerated, the person in charge of the fumigation shall insure that a qualified person using gas or vapor detection equipment test spaces adjacent to the fumigated cargo area and regularly occupied spaces for fumigant leakage.

If leakage of the fumigant is detected, the person in charge of the fumigation shall take action to correct the leakage or shall inform the master of the vessel or his representative, of the leakage so that corrective

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08100 U d. Usage_Guide

(9) Review with the master, or his representative, the voyage precautions and procedures.

*Personal protection equipment means a respirator or gas mask fitted with a canister designed for phosphine gas which is approved by NIOSH/MSHA. A gas mask and canister is approved for use up to 15 ppm. Above 15 ppm or at unknown concentrations a SCBA or its equivalent must be used.

08200

	PELLEIS	TABLEIS	UNIQUE VOLUME*
08350	150-250	30-50	1000 CU. FT.
08450	200-375	40-75	1000 BUSHELS

08500 *Volume or storage capacity of the area being treated.

08600
08700 U e. Procedures_for_Bulk_Dry_Cargo_Vessels_and_Tankers:

08800 (1) Apply either the tablets or pellets by scattering them
08850 uniformly onto the commodity surface utilizing as much
08900 of the total surface area as possible, or insert them
08950 uniformly into the commodity mass by hand or with probes
09000 to any depth desired.

09100 (2) Close and secure hatch covers, tank tops, butterworths,
09150 etc. immediately following application.

09200
09300 U f. Voyage_Precautions_and_Procedures:

09400 (1) At regular intervals monitor spaces adjacent to areas
09450 containing fumigated cargo and all regularly occupied areas
09500 for fumigant leakage using appropriate gas detection
09550 equipment.

09600 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.

09700 (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.

09800 (3) Do not enter fumigated holds or tanks.

09900 (4) Do not open, ventilate or aerate the fumigated holds during the voyage.

