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PROPER HANDLING, FIRST AID AND DISPOSAL OF

Detia

GAS EX-B A PHOSPHINE FUMIGANT

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RESTRICTED USE PESTICIDE

For Retail Sale To And Use Only By Certified Applicators Or Persons Under Their Direct Supervision And Only For Those Uses Covered By The Certified Applicator's Certification

ACCEPTED

MAY 14 1979

Under the Federal Insecticide, Fungicide, and Rodenticide Act, as amended, for the pesticide registered under EPA Reg. No. 2548-59

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INTRODUCTION

This bulletin has been prepared by Research Products Company, distributor for Detia Gas Ex-B, in the interest of educating users with respect to the proper handling of Detia Gas Ex-B as well as providing specific technical information.

The history of Detia Gas Ex-B is long, dating back to the mid 1930's. Only recently has it been introduced into the U.S.A. and Canada. The manufacturer of the product, Dr. Werner Freyberg—Chemische Fabrik—Weinheim, West Germany, invented the Detia Gas Ex-B concept.

Needless to say, Detia Gas Ex-B is a poisonous fumigant. It, when used properly, is effective to one degree or another. It is designed to accomplish specific objectives when used in a prescribed manner. And, it can be mis-used which could lead to situations that might be potentially harmful to man.

It is the intent of Research Products Company to provide information via this bulletin which will be beneficial in the thorough training of users. All potential users should read this bulletin in combination with other literature and instruction provided by Research Products Company.

WHAT IS DETIA GAS EX-B

It is a fumigant utilizing a packaging concept that permits the easy use of aluminum phosphide on a wide range of commodities for the control of certain insect pests. The packaging concept is important to users as it allows a method of fumigation whereby the likelihood of product contamination is minimized. Additionally, the concept affords the user a labor-saving convenience during application as well as during disposal.

The active ingredient in Detia Gas Ex-B is aluminum phosphide. When carefully and exactly combined with other chemical compounds, the preparation will, upon exposure to atmospheric moisture, release *hydrogen phosphide*. Hydrogen phosphide is commonly known as phosphine...a widely used and effective fumigant.

The Detia Gas Ex-B concept is one that permits the packaging of the aluminum phosphide preparation into paper bags which becomes an integral part of the concept. Therefore the bags should never be torn open during fumigation. Once the bags are removed from the original shipping container, a hermetically sealed metal can, they will begin releasing hydrogen phosphide in quantity after approximately 30 minutes. The release is dependent on atmospheric temperature and relative humidity. The greater the temperature and humidity, the faster the release.

WHAT IS HYDROGEN PHOSPHIDE

Hydrogen phosphide, more commonly known and referred to as phosphine, is a colorless, toxic gas possessing an odor like that of decaying fish, garlic, or commercial carbide. It is a very active gas with a very high vapor pressure. The penetrating capability of phosphine is great. And, even though heavier than air, it acts very much like a gas in vacuum. The combination of high molecular activity, vapor pressure and toxicity to insects accounts for its world-wide acceptance as a fumigant. Additionally, phosphine does not present the residue problems inherent with other commercially used fumigants. Residual tolerances have been established at 0.1 ppm for raw agricultural commodities and 0.01 ppm for specified processed foods.

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PHYSICAL CONSTANTS

Chemical Formula	PH_3
Molecular Weight	34.04
Vapor Pressure 70 deg. F.	545 PSIG
Specific Volume 70 deg. F., 1 atm	10.5 cu. ft./lb.
Boiling Point 1 atm	−124.9 deg. F.
Freezing Point 1 atm	−207.4 deg. F.
Density 32 deg.	1.529 g/l
Density, Liquid (194 deg. F., 90 deg. C)	0.746 g/ml
Specific Gravity Gas (68 deg. F., 20 deg. C) (air=1)	1.183
Critical Temperature	124.3 deg. F. (51.3 deg. C.)
Critical Pressure	948 P.S.I.A. (64.5 atm)
*Lower Explosion Limit	1.79-1.89% by volume (26.15-27.6 g/m³) 17,000 to 18,900 PPM

Threshhold Limit Values
Maximum Allowable Concentration
(8 hr. working day) ..... 0.3 PPM

Reference: International Critical Tables—Pages 3, 4, 8, 22, 23, 116, 180, 109, 213, 228, 229, 248, 259, 260

*Pure hydrogen phosphide can undergo spontaneous heating and ignition if confined to the point that a rather heavy concentration in air is reached. The lower limit has been established at 1.79% be volume in air, or 17,900 ppm. The highest recommended use levels of Detia Gas Ex-B are far below the lower limit.

ABOUT THE BAG

It is more than a vessel for a skillfully prepared aluminum phosphide preparation. The bag, in combination with the preparation, permits the controlled release of phosphine. The tough, expandable, permeable paper used is an integral part of the total concept.

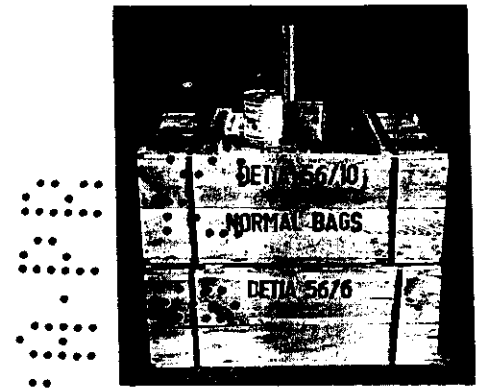
There are two (2) basic bags. One is referred to as "normal size" and the other as "long narrow". Both contain exactly the same quantity of preparation:

34 Grams ..... 57% Aluminum Phosphide
43% Inert Ingredients

Both release 11 grams of phosphine when exposed to moist air. The Long Narrow is particularly adaptable to flat stored grain. The Normal bag is particularly adapted to commodity fumigation in space. However, the Long Narrow is often used for space as well.

An aluminum phosphide preparation, such as found with Detia Gas Ex-B, expands during the process of absorbing atmospheric moisture (to release phosphine). The crepe design of the bag permits this expansion without fear of rupture. Additionally the bags are carefully sewn to prevent leakage at the seams. The expandability feature, along with the closing technique, prevents the contamination of the product.

Normal bags are packed either 6 or 10 to a can and Long Narrows, 15. The basic dosage for Detia Gas Ex-B is 3 bags per 1000 cubic feet. Thus, the packaging differential permits a wide combination of useful selection. The metal cans are hermetically sealed and are easily opened with a common strip key. Each can contains a secured gas-absorbing pouch that serves to absorb any loose hydrogen phosphide liberated between filling and packing.



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WHERE CAN DETIA GAS EX-B BE USED

It is especially suited, but not limited, to commodity fumigation in space: box cars, bulk rail cars. vaults, warehouses, trailer vans, commodities under tarp, shallow bulk commodity bins, buildings or any structure that can be sealed gas tight.

The Long Narrow bags are particularly well adapted to flat stored bulk grain. An eyelet in the bag permits easy insertion into grain by means of a special probe. Normal bags may be added directly to grain as bins or silos are filled. In either case it would be necessary to provide for the removal of the bags after fumigation is complete.

All pesticides must be registered with the Environmental Protection Agency, Pesticide Registration Division, of the U.S.A. Government and similar agencies in other countries. Detia Gas EX-B is registered for use on specified processed foods, specified raw agricultural commodities, stored grain, animal feeds and tobacco.

A complete listing of commodities is shown on the label. A partial list is shown below:

Raw Agricultural Commodities

Rice
Wheat
Barley
Corn
Oats
Sorghum
Millet
Rye
Cocoa Beans
Coffee Beans (raw)
Dates
Filberts
Pecans
Pistachio Nuts
Walnuts
Cashews
Brazil Nuts
Almonds
Peanuts
Sunflower Seeds
Cottonseed
Popcorn
Soybeans
Safflower Seeds
Adzuki Red Beans
Blackeye Peas
Garbanzo Beans
Great Northern Beans
Green Split Peas
Lentil Peas
Lima Beans
Michigan Navy Beans
Moth Beans
Mung Beans
Pinto Beans
Split Urds

Processed Foods

Wheat Bran
Polished Rice
Brewers' Rice Grits
Corn Grits
Flour
Tobacco
Macaroni
Spaghetti
Packaged Cereals
Pretzels
Oat Meal
Cake Flour
Spices
Whole Wheat
Bulgar
Brewers' Malt
Wheat Germ
Cream of Wheat
Barley Malt
Wheat Shorts
Processed Coffee/
Tea (roasted-dried)
Prepared Cocoa
Dried/Processed
Meat-Fish-Cheese
Seasoning
Condiments (ground)
Cookies
Crackers
Snack Foods
Herbs
Dried Fruits
Eggs
Sugars
Candy Bars-Candy
Pastry Mixes
Dried Powered Milk
Nuts-Processed

Animal Feeds

The registered use of Detia Gas Ex-B is in a continual process of expansion as research and development proceeds. From time to time the above list will be expanded to include other goods and commodities.

Detia Gas Ex-B is used for the control of certain insect pests listed below:

Granary Weevil *Sitophilus granarius (L.)*
Rice Weevil *Sitophilus oryzae (L.)*
Lesser Grain Borer *Rhizopertha dominica (F.)*
Saw-toothed Grain Beetle *Oryzaephilus surinamensis*
Confused Flour Beetle *Tribolium confusum (Duv.)*
Indian Meal Moth *Plodia interpunctella*
Yellow Meal Worm *Tenebrio molitor (L.)*
Red Flour Beetle *Tribolium castaneum (Herbst)*
Spider Beetles *Ptinidae*
Hairy Fungus Beetle *Typhaea stercorea (L.)*
Mediterranean Flour Moth *Anagasta (Ephestio) kuehniella*
Bean Weevil *Acanthoscelides obtectus (Say)*
Cigarette Beetle *Lasioderma serricorne (F.)*
Tobacco Moth *Dephestiaelutella (Hubner)*
Angoumois Grain Moth *Sitotroga cerealella (Oliv)*
Cadelle *Tenebroides mauritanicus (L.)*
Khapra Beetle *Trogoderma granarium (Ev.)*

HOW IS DETIA GAS EX-B USED

The Detia Gas Ex-B concept suggests convenience and ease of use. However, there are specific procedures to be followed which insure effective results. Recommended methods of application are described separately from this bulletin.

A Detia Gas Ex-B fumigation consists of placing the bags in a specified manner within a structure that can be sealed virtually gas tight. After a building, rail car, warehouse, etc., has been fully prepared and sealed it is simply a matter of determining the correct dosage, opening the cans, and placing the bags in the prescribed manner.

CAN DETIA GAS EX-B BE MIS-USED

All fumigants can be mis-used. A mis-use is any use that contributes to ineffective results or is likely to result in a situation that is potentially dangerous.

1. The dosage recommendations for Detia Gas Ex-B have been carefully calculated. Users should never exceed label recommendations. Nor should they under-dose. Generally, a dosage of 3 bags/1000 cubic feet is adequate, provided the exposure period is at least 72

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hours with constant temperature above 77° F. and relative humidity in excess of 60%. *A shortened exposure period cannot be compensated for with increased dosage.* While it is possible to use Detia Gas Ex-B at temperatures as low as 40°F., to do so necessarily increases the exposure period to possibly impractical limits.

2. Phosphine is a very active gas with a high vapor pressure. Even though extremely toxic to insects, it is absolutely necessary that any structure being fumigated be sealed as gas tight as possible. To miss sealing any single large opening, such as a vent or small window, will ruin a fumigation. To miss sealing only a few very small openings or cracks will materially affect results.
3. Detia Gas Ex-B should never be used in such a manner as to allow the build-up of gas whereby the concentration would reach the lower ignition level of 1.79% by volume. Recommended dosage levels are far below that required to reach the limit.

   Contact with water or other liquids causes spontaneous heating and spontaneous ignition of the evolved gas unless the following are observed. Do not use bags that have been exposed to water or other liquids in any way. Do not use bags where they are liable to come in contact with water or other liquids. Do not use bags that have been damaged in any way. Do not wrap, cover or confine used or unused bags. Do not have bags contact each other — use bags singly with spacing between.
4. The release of phosphine from Detia Gas Ex-B is controlled by design. The release begins slowly after 30 minutes or so, gradually building up to peak levels after 20 hours. *The release cannot be speeded up.* To attempt to do so is potentially dangerous.
5. Phosphine is capable of penetration through a wide variety of dense and/or seemingly gas tight materials. Hadite block walls, for example, will be penetrated quickly. The end result will be an ineffective kill and the endangerment of life in adjoining rooms. The same would be true of poorly constructed wooden buildings. Leakage from stationary structures can be off-set somewhat, but not entirely, by increasing the dosage to the highest recommended level.
6. Phosphine reacts corrosively with copper, brass, gold and other precious metals. Thus, switch gear, communication devices, small electric motors, etc., should be protected or removed from the area to be under gas. Protection can be afforded with vaseline on contact points or totally wrapping devices with heavy polyethylene film.

STORAGE AND HANDLING PRECAUTIONS

Hermetically sealed cans of Detia Gas Ex-B are shipped in heavy wooden crates. As long as crates and/or cans are not opened, the shelf life is practically unlimited. Cans and crates should be stored in cool, dry, locked rooms.

1. Protect cans and crates from moisture, open flame, heat, acids and other chemicals.
2. Never store near homes or living quarters.
3. Never store in areas prone to vandalism.

In addition to instructions and precautions found on the label, be certain to:

Study the recommended application procedure.

Notify local authorities where applicable.

Only personnel properly trained in the use of Detia Gas Ex-B should conduct fumigations.

First aid equipment and information should be readily available.

Proper respiratory equipment should be readily available for each operator.

The area to be fumigated should be adequately posted with danger signs.

Be certain that any adjoining facilities are evacuated and properly posted with danger signs.

Always work in pairs, never alone.

Always open cans in open air.

Never smoke or eat while handling the bags.

Always wash hands after handling the bags.

Never attempt to save bags. IT CANNOT BE DONE!

DISPOSAL OF DETIA GAS EX-B

IMPORTANT: The release of phosphine from Detia Gas Ex-B is dependent on atmospheric temperature and humidity. Be certain minimum temperature requirements have been met before attempting disposal.

MINIMUM EXPOSURE REQUIREMENTS

Below 40° F.	Do not fumigate
40°-49° F.	14 days (336 hours)
50°-59° F.	7 days (168 hours)
60°-77° F.	4 days (96 hours)
Above 77° F.	3 days (72 hours)

METHOD ONE: Use only if minimum exposure requirements for existing conditions are known and met.

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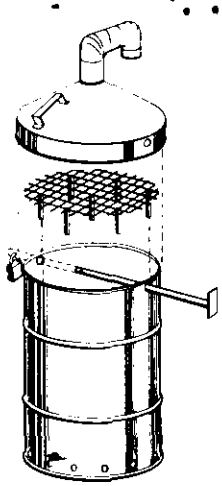
Collect bags and arrange for their direct transportation to an approved burial site or to an approved pesticide incinerator for burning.

METHOD TWO: For use when minimum exposure requirements for existing conditions have *not been met*, or, if exposure details are *unknown*.

Collect bags and transport them to an isolated, open area. Wear a full faced gas mask fitted with a canister for protection against phosphine. Cut or tear open each bag and dump the contents into a receptacle (bucket, barrel, etc.) containing a mixture of water and a non-ionic surfactant (2% by volume). Stir until all dust has settled. Transport the resulting slurry to an approved site for burial.

Method One is only applicable when it is known that minimum exposure requirements have been met. Whenever possible such spent bags should be transported directly and immediately to an approved burial site or to an approved pesticide incinerator for burning. THE SPENT BAGS SHOULD NEVER BE PLACED IN ORDINARY TRASH RECEPTACLE OR DUMPSTERS. NOR SHOULD THEY EVER BE TRANSPORTED TO THE DISPOSAL SITE BY ANYONE OTHER THAN THE ACTUAL USER. In lieu of immediate disposal it may be more practical, particularly in the case of smaller users, to collect spent bags and place them into an especially designed 55-gallon oil drum as illustrated on next page.

Note the cone shape, vented lid as well as the expanded metal false floor, the 10x1" diameter hole evenly spaced around the bottom, the 5x1" diameter holes in the bottom (not shown) and the locking device. The purpose of the drum is to provide a central, known collection point for bags *known to be spent*. When full or at regular intervals



the drum can be transported directly to an approved disposal site. WITHOUT EXCEPTION THE TRANSPORTATION MUST BE PERFORMED BY

THE USER BEING CERTAIN THAT WHEN THE DRUM IS EMPTIED THAT THE BAGS ARE IMMEDIATELY BURIED, OR, BURNED IN THE CASE OF AN APPROVED PESTICIDE INCINERATOR.

The drum should be located in an open, secured area known to all and marked as the collection center for spent Detia Gas Ex-B.

METHOD TWO: Detia Gas Ex-B is often used for the fumigation of rail cars intransit. BECAUSE THERE IS A CHANCE THAT INTRANSIT TIME HAS BEEN TOO SHORT TO PERMIT COMPLETE GAS RELEASE RECEIVERS OF FUMIGATED CARS MUST BE PREPARED TO DEAL WITH PARTIALLY SPENT BAGS. Thus, receivers must determine the following before attempting disposal:

1. The number of days or hours the car has been under fumigation, and—
2. The approximate temperature the bags have been exposed to during the duration of the fumigation.

IF IT IS DETERMINED OR EVEN SUSPICIONED THAT THE MINIMUM EXPOSURE REQUIREMENTS HAVE NOT BEEN MET *METHOD TWO* MUST BE USED.

As an aid to receivers users have been provided with certain aids to use that assist receivers in determining exposure history. Namely, a packet that contains disposal instructions; an information card showing the shipper, city, date, time of day, temperature and number of bags used; and a first aid card providing vital information.

NOTE: DO NOT TAKE CHANCES WITH DETIA GAS EX-B. IF THERE IS ANY QUESTION THAT BAGS HAVE NOT MET THE MINIMUM EXPOSURE REQUIREMENTS SUCH BAGS MUST BE DISPOSED OF BY *METHOD TWO*.

FIRST AID

SYMPTOMS OF HYDROGEN PHOSPHIDE (PHOSPHINE—PH_3) POISONING:

Sensation of cold
Pulling pains in the region of the diaphragm, and numbness
Diarrhea
Vomiting
Vertigo (dizziness)
Tinnitus
Anxiety state
Sensation of oppression in chest
Dry cough
Furred tongue (coating on the tongue)
Loss of appetite
Intense thirst

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Dyspepsia (acute indigestion)
Gastric pains
Reeling—accompanied by vomiting
Pains in limbs
Enlarged pupils
Choking attacks
Rapid onset of stupor

Any of the above may be taken as symptoms of phosphine poisoning. At first warning or appearance that someone has been affected by phosphine, *they must be taken to fresh air immediately—call a doctor immediately.* The patient should be laid down and kept warm with blankets. Supply patient with pure oxygen and maintain respiration, artificially if required. Some symptoms do not appear for 24 hours.

When the doctor arrives, advise him as to the patient's actions—nausea or vomiting, etc. Supply the doctor with proper first aid instructions or put him in contact with nearest poison control center.

NOTE TO PHYSICIAN

Complete rest for patient: 1-2 days—no activity—keep patient warm. Intravenous glucose injections (as normal practice) if patient suffers from nausea and vomiting. If, however, an increase in the blood-sugar is found, isotonic salt solutions (physiological salt—or Ringer's solution *without glucose*) must be injected instead.

Inhalation of oxygen or oxygen/carbon dioxide is usually successful. Use of cardiac and circulatory stimulants normally advisable.

In extremely serious cases of poisoning, blood transfusions are recommended. *In no circumstances must an antidotal use be made of fats, oils (castor oil), butter or milk.*

Phosphine (PH_3) poisoning is not chronic; phosphine action is reversible and symptoms will disappear by themselves.

GAS MASKS

It is normally not necessary to actually wear a gas mask when fumigating with Detia Gas Ex-B. However, always have on the person a "full faced" gas mask, fitted with a canister designed for phosphine gas *only*, approved by the U.S. Dept. of Interior, Bureau of Mines, for phosphine protection.

Detia Gas Ex-B has a garlic, decayed fish or commercial carbide odor. When a strong odor is detected, put on gas masks immediately and determine the concentrations with proper test equipment before proceeding.

After all bags have been placed and the premises have been locked and sealed, do not re-enter until the required exposure period has been reached and complete aeration has been accomplished. Be certain to test the atmosphere for presence of gas.

Gas masks and canisters must be manufactured by the same company and used together. The following manufacturers have indicated their gas masks and canisters are approved by the Bureau of Mines for phosphine protection up to .5% by volume in the area.

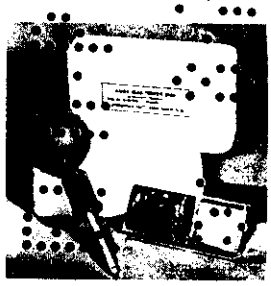
Acme Protection Equipment Co.
Canister 084PHOV-R
Bureau of Mines 14-F-70

Mine Safety Appliance Co.
Canister #77713 GMC-SS-1
Bureau of Mines 14-F-61

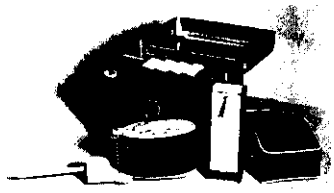
Wilson Products Div. Ray-O-Vac Co.
Canister LG10
Bureau of Mines 14-F-68 or 14-F-69

GAS DETECTION EQUIPMENT

Phosphine is a poisonous gas and is to be treated accordingly. From time to time it will be necessary to check the atmosphere for the presence of phosphine. This is particularly true of buildings and/or warehouses following a fumigation. There are many commercially available sampling devices, two of which are illustrated below. Both are easy to operate, reliable and inexpensive.



AUER GAS TESTER



DRAGER MULTI GAS DETECTOR

All users of Detia Gas Ex-B should have testing equipment available.