

RESTRICTED USE PESTICIDE

(Due To Acute Inhalation Toxicity Of Sulfuryl Fluoride)

For 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. An applicator certified by the state must be present on site at all times during introduction of fumigant, reentry prior to aeration, and during the initiation of the initial aeration procedure when exposure exceeds 1 ppm.

MANUAL FOR STRUCTURAL FUMIGATION



Drexel®

MASTER FUME®

Specialty Gas Fumigant

For control of: Existing infestations of listed insects and related pests such as (or including) Bed bugs, the larvae and adults of Carpet beetles (except egg stage), Clothes moths, Cockroaches (American, Brown-banded, Oriental cockroaches), Death watch beetles, Drywood termites, Formosan termites, Old house borers, Powder post beetles, Rodents (rats, mice).

For use in dwellings (including mobile homes), Buildings, Construction Materials, Furnishings (household effects), Shipping containers, and Vehicles including automobiles, buses, passenger railcars, recreational vehicles (but not including aircraft) and surface ships.

ACTIVE INGREDIENT:

Sulfuryl fluoride 99.8%

OTHER INGREDIENTS: 0.2%

TOTAL: 100.0%

KEEP OUT OF REACH OF CHILDREN

DANGER  PELIGRO

POISON  VENENO

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

See FIRST AID Below

EPA Reg. No. 19713-596

FIRST AID

IF INHALED:

- Get exposed person to fresh air.
- Keep warm and at rest.
- Make sure person can breathe freely.
- If breathing has stopped give artificial respiration.
- Do not put anything in the mouth of an unconscious person.
- Call a poison control center or doctor for further treatment advice.

IF LIQUID IS ON SKIN OR CLOTHING:

- Immediately apply water to contaminated area of clothing before removing.
- Once area has thawed, remove contaminated clothing, shoes, and other items covering skin.
- Wash contaminated skin area thoroughly or shower.
- Call a poison control center or doctor for treatment advice.

IF LIQUID IS IN EYES:

- Hold eye open and rinse slowly and gently with water for 15 to 20 minutes.
- Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.
- Call a poison control center or doctor for treatment advice.

(Continued)

(Cont.)

In all cases of overexposure, such as nausea, difficulty in breathing, abdominal pain, slowing of movements and speech, numbness in extremities, get medical attention immediately. Take person to a doctor or emergency treatment facility. Have the product container or label with you when calling a poison control center or doctor, or going for treatment. For information on this pesticide product (including health concerns, medical emergencies or pesticide incidents), call the National Pesticide Information Center at 1-800-858-7378.

Note to Physician: This product is a gas which has no warning properties such as odor or eye irritation. (However, chloropicrin is used as a warning agent and is a known lachrymator). Early symptoms of exposure to this product are respiratory irritation and central nervous system depression. Excitation may follow. Slowed movement, reduced awareness, and slow or garbled speech may be noted. Prolonged exposure can produce lung irritation, pulmonary edema, nausea, and abdominal pain. Repeated exposure to high concentrations of this product can result in significant lung and kidney damage. Single exposures at high concentrations have resulted in death. Treat symptomatically. The liquid form of this product in the eye may cause damage due to refrigeration or freezing.

PRECAUTIONARY STATEMENTS

Hazards to Humans and Domestic Animals

DANGER: Fatal if inhaled. May be fatal if swallowed. Extremely hazardous liquid and vapor under pressure. Liquid may cause freeze burns of exposed skin.

Do not get in eyes, on skin, or on clothing. This product is an odorless gas fumigant. Exposure to toxic levels may occur without warning or detection by the user.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Protective Clothing

Wear splash-resistant goggles (goggles designed and made of material that allows no measurable movement of the liquid pesticide being used to pass through them during use) or full face shield for eye protection during introduction of the fumigant. Do not wear gloves or rubber boots. Do not reuse clothing or shoes that have become contaminated with this product until thoroughly aerated and cleaned.

Respiratory Protection

If the concentration of this product in the breathing zone of the fumigated area (as measured by a detector device with sufficient sensitivity such as an INTERSCAN, MIRAN or SF-ExplorIR™) does not exceed 1 ppm (4 mg/cubic meter), no respiratory protection is required. [A breathing zone is defined as the area within a structure where individuals typically stand, sit or lie down.] If the concentration of this product is greater than 1 ppm, further aeration and re-testing is required. When this concentration is exceeded or when concentration is unknown, all persons in the exposed area must wear a NIOSH or MSHA approved positive pressure self-contained breathing apparatus (SCBA, not SCUBA) or combination air-supplied/SCBA respirator such as manufactured by Draeger, Ranger, Survivair, Scott or MSA. Before using any make or brand of SCBA, learn how to use it correctly. Determine that it has an adequate air supply for the job at hand, that it fits properly, providing an adequate seal around the face and that it is in good working order.

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Read the entire label. Use only according to label directions. Before buying or using this product, read "WARRANTY DISCLAIMER".

In case of emergency endangering health or the environment involving this product, call 1-877-208-2593. If you wish to obtain additional product information call Drexel Chemical Company at (901) 774-4370.

Agricultural Chemical: Do not ship or store with food, feed, drugs or clothing.

INFORMATION

When fumigating, observe local, state, and federal rules and regulations including such things as use of chloropicrin, clearing devices, positive-pressure self-contained breathing apparatus, security requirements, and placement of warning signs.

APPLICATION PERSONNEL MUST PARTICIPATE IN DREXEL CHEMICAL'S SULFURYL FLUORIDE TRAINING AND STEWARDSHIP PROGRAM, MASTER TRAIN.

This manual is part of the labeling for this product. This manual was written to expand on information contained in the product label and is not intended to supersede the container label, State or local requirements. All information contained in this manual is to help better stewardship the use of this product.

Read and be familiar with this manual before using this product. Follow all label precautions, directions, and restrictions. Prior to the parties entering into a fumigation agreement, the Fact Sheet for this product must be provided to an adult occupant of the structure to be fumigated.

This product is a highly hazardous material. Only individuals knowledgeable of the hazards of this chemical and trained in the use of required respiratory equipment, detector devices, emergency procedures and in the proper use of this fumigant are allowed to use this product. Two persons trained in the use of this product must be present during introduction of the fumigant, reentry prior to aeration, during the initiation of the initial aeration procedure when exposure exceeds 1 ppm and when testing for reentry after aeration (if aerated in an enclosed space) with at least one person being an applicator certified by the state. It is essential that no occupant reenter the fumigated space after fumigation until the fumigant has been aerated and the space has been fully tested and cleared for reentry.

Two persons need not be present if monitoring is conducted remotely (outside the area being fumigated) and no one enters the fumigated structure.

See Chapter 4 for detection device.

ENVIRONMENTAL HAZARDS

Sulfuryl fluoride is a highly toxic gas. This pesticide is toxic to fish and wildlife.

PHYSICAL OR CHEMICAL HAZARDS

Sulfuryl fluoride is a colorless, odorless toxic gas. Cylinders of this product are under pressure and must not be stored near heat or open flame.

Exposures to temperatures above 158°F will cause a fusible plug to melt and the contents will be released. Under high heat conditions (temperatures above 752°F), this product can decompose into sulfur dioxide (SO₂), hydrofluoric acid (HF), and other decomposition products. Hydrofluoric acid is highly reactive and can corrode or damage many materials including metals, glass, ceramic finishes, fabrics, etc. Extinguish all flames including pilot lights of furnaces, hot water heaters, dryers, gas refrigerators, ranges, ovens, broilers, etc. Turn off or unplug all electrical heating elements that represent a reasonable risk of a heat source that is at or near 752°F. Shut off automatic switch controls for appliances and lighting systems that will be included in the space to be fumigated. Shut off gas service at the main service valve. Sulfuryl fluoride can react with strong bases such as some photo developing solutions.

FUMIGATING WITH THIS PRODUCT PRODUCT INFORMATION

MASTER FUME contains the active ingredient, sulfuryl fluoride, and is registered for use only by professional fumigators to control pests in construction materials and furnishings (household effects), fumigation chambers, structures, shipping containers, and vehicles including automobiles, buses, surface ships, passenger railcars and recreational vehicles (except aircraft).

MASTER FUME IS A RESTRICTED USE PESTICIDE DUE TO ACUTE INHALATION TOXICITY OF SULFURYL FLUORIDE.

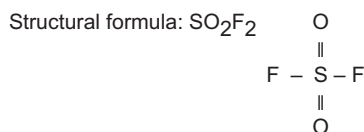
APPLICATION PERSONNEL MUST PARTICIPATE IN DREXEL CHEMICAL'S SULFURYL FLUORIDE TRAINING AND STEWARDSHIP PROGRAM, MASTER TRAIN.

Carefully read the container label and this manual before using this

product. Do not use this product without Drexel Chemical's Master Fume Calculator program. Drexel Chemical's Master Fume Calculator is a program available to calculate safe and effective levels of this product for fumigations. Never allow untrained individuals to use this product.

PHYSICAL PROPERTIES

Sulfuryl fluoride is a colorless, odorless toxic gas. Cylinders of this product are under pressure and must not be stored near excessive heat or open flame. Exposures to temperatures of more than 158°F will cause a fusible plug to melt and the contents will be released.



Molecular Weight:	102.07 AMU
Color:	None
Odor:	None
Active Ingredient:	10.8 lbs. sulfuryl fluoride per gallon of product
Specific Gravity:	1.35 at 20°C (68°F)
Vapor Density:	4.3 g/L at 20°C (68°F) air = 1
Vapor Pressure:	15.2 atm at 20°C (68°F)
Boiling Point:	-55.2°C (-67°F) at 760 mm Hg

GAS SOLUBILITY at Pressure = 1 ATM: 25°C (77°F) and in water 0.075% (750 ppm) by weight, only slightly soluble in organic solvents and vegetable oils.

STABILITY: Stable to temperatures normally encountered in space fumigations. Non-flammable under normal conditions in all atmospheric concentrations. However, heaters and open flames must be extinguished as temperatures over 400°C (752°F) will cause decomposition products to be formed which can be corrosive and etch metal and glass.

HEAT OF VAPORIZATION: 81.1 BTU per pound at -55°C (-67°F) or 4,600 cal./mol. 1 pound of sulfuryl fluoride = 4.45 moles. 1 pound of this product will lower 1000 cubic foot of dry air by 2.5°C (4.5°F).

VOLUME PER POUND: 1 pound of gas occupies 3.8 cubic foot at 25°C (77°F) and 760 mm Hg. 1 pound of gas per 1000 cubic foot of unoccupied space equals approximately 3850 ppm at room temperature and pressure (25°C at 760 mm Hg).

HYDROLYSIS: Slow in water; Rapid in basic solutions.

REACTIVITY: Sulfuryl fluoride is relatively non-reactive as a gas. No malodor or corrosive effects have been detected when the chemical has been used as directed. Sulfuryl fluoride can react with strong bases such as some photo developing solutions.

DIRECTIONS FOR USE

RESTRICTED USE PESTICIDE

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

When fumigating, all local, state and federal rules and regulations regarding use of detection devices, positive-pressure self-contained breathing apparatus, security requirements, warning agent, and placement of warning signs must be observed.

Read carefully all Directions for Use before using this product.

Chapter 1

PESTS CONTROLLED

Uses

This product is used for the control of existing infestations of listed insects and related pests such as (or including) Bed bugs, the larvae and adults of Carpet beetles (except egg stage), Clothes moths, Cockroaches (American, Brown-banded, Oriental cockroaches), Death watch beetles, Drywood termites, Formosan termites, Old house borers, Powder post beetles, Rodents (rats, mice). It is also for use in dwellings (including mobile homes), Buildings, Construction Materials, Furnishings (household effects), Shipping containers, and Vehicles including automobiles, buses, passenger railcars, recreational vehicles (but not including aircraft) and surface ships.

Biological Activity of This Product

The toxicity of fumigants, including this product, is mainly determined by the uptake of the fumigant by the target pest during the time of exposure. Eggs of arthropods are less susceptible to this product as compared to its post-embryonic stages. Poor ovicidal activity of this product is mainly due to its lack of penetration through and binding to the eggshell and membranes.

For social insects such as ants and termites, control of the egg stage is not necessary when workers are eradicated as eggs will not survive in the absence of care workers. For ants and termites, dosage lethal to workers will also kill winged reproductives, called swarmers. Toxicity of this product to the post-embryonic stages of arthropods is dependent on its intrinsic metabolism and respiration rates. The faster the locomotion is, the more susceptible the arthropod is to this product. For example, adult cockroaches, flies, ants, and fleas are very susceptible to this product with 95 to 99% mortality at less than half the drywood termite dosage compared to adult ticks and spiders which require two-fold the drywood termite dosage for 99% mortality. Post-embryonic stages of carpenter ants and subterranean termites are susceptible to the same dosage of this product. Their nests, however, which contain reproductives and brood are usually hidden outside of the fumigation zone. Thus, the colony is able to survive and reinvade the structures. For this reason, fumigation should be conducted only when colonies are above ground and in the structure to be fumigated, and are inaccessible for localized treatments. For example, Formosan subterranean termites often make aerial nests and galleries that allow colonies to exist without ground contact. Fumigation using this product is sometimes necessary. Higher dosage of this product is required to kill many non-social insects. Dermestid beetles and some species of cockroaches require two fumigations as the maximum application rate of this product which is 10-fold the drywood termite dosage is not sufficient to kill egg stage. The second fumigation is conducted after eggs surviving the first fumigation have hatched and before reaching adulthood. Rodents, unlike insects, are warm blooded animals and do not require increased dosages at lower temperatures. Use 80°F as the calculating temperature for proper dose determination. The dose rate will be half

of the rate for drywood termite control. For a successful rodent fumigation, the fumigator, however, must use sufficient gas to accumulate at least 36 ounce-hours of exposure.

The following table lists the rates to be used for complete ovicidal activity.

Pest	Dosage to be Used as Multiple of Drywood Termite Rate
Rodents*	0.5X
Carpet beetles**	1X
Cockroaches**	1X
Furniture carpet beetles**	3X
Bed bugs	3X
Old house borers	4X
Formosan termites	4X
Clothes moths	6X
Powder post beetles	10X
Death watch beetles	10X

* To determine the proper dose for rodent control, use 80°F as the calculating temperature. Unlike insects, rodents are warm blooded and do not require increased dosages at lower temperatures. At least 36 ounce-hours must be accumulated, regardless of temperature, for successful rodent fumigation.

** To control infestation after the eggs hatch, more than one fumigation may be needed.

Do not use less than the specified dosage factors when treating for rodents, cockroaches, bedbugs, and termites.

Latent Mortality

Judgement of the success or failure of fumigation should not be made on the presence of live organisms immediately following fumigation. Sometimes live insects may be found immediately after fumigation. Under optimum or favorable conditions, the target pest will be dead or obviously dying by the end of the fumigation period. Researchers have observed a delay in mortality of 3 to 5 days for termite species and have waited as long as 2 weeks to determine mortality of arthropods.

Delayed mortality (latent mortality) in insects occurs for exposures very near mortality threshold levels. Generally, within a species, the latent mortality period for the egg stage is longer and more variable compared to other life stages.

Signs of activity or live non-target organisms after fumigation do not mean failure because:

1. Different organisms vary in their lethal dose requirements and may be higher for non-target organisms than for the targeted pest.
2. The organism may have received the toxic dose and will eventually die (delayed mortality).
3. Newly hatched larvae of the non-target organism may appear from eggs not killed by the fumigant.
4. The non-target organism may have entered the structure during the aeration period.
5. Frass pellets or powder may continue to fall out of damaged woods for weeks or months following fumigation.

Mortality of arthropods following exposure to sulfuryl fluoride gas fumigant is presented in the following table:

Lethal accumulated dosages (LAD ₉₉) (oz.-hrs./1000 cu. ft.) of Sulfuryl fluoride for various arthropod species							
Pest		Hours of Exposure	Temp (°F)	Life Stage			
Scientific Name	Common Name			Egg	Larva/Nymph	Pupa	Adult
Ants							
<i>Camponotus floridanus</i>	Carpenter ant	8	81	–	–	–	18 (5)
<i>Camponotus modus</i>	Carpenter ant	8	61	–	–	–	48 (8)
<i>Camponotus vicinus</i>	Carpenter ant	8	61	–	–	–	35 (8)
Bed bugs							
<i>Cimex lectularius</i>	Bed bug	16	80	64 ^a (14)	64 ^a (14)	–	64 ^a (14)
Cockroaches							
<i>Blattella germanica</i>	German cockroach	16	80	–	–	–	19 ^c (3)
		4	70	64 ^e (13)	–	–	16 (2)
		8	81	–	17 ^f (9)	–	–
<i>Periplaneta americana</i>	American cockroach	16	80	413 ^c (14)	–	–	9 ^c (7)
		8	81	>402 ^d (14)	–	–	–
<i>Supella longipalpa</i>	Brown-banded cockroach	16	80	>256 ^d (14)	64 ^a (14)	–	64 ^a (14)
Dermestid beetles							
<i>Anthrenus flavipes</i>	Furniture carpet beetle	22	80	854 (18)	156 (8)	–	78 (6)
		16	80	1213 ^c	38 ^c (14)	–	–
<i>Attagenus unicolor</i>	Black carpet beetle	22	80	1694 (18)	68 (2)	–	44 (4)
<i>Dermestes maculatus</i>	Hide beetle	22	80	769 (5)	28 (6)	–	29 (3)
<i>Trogoderma granarium</i>	Khapra beetle	8	70	>499 ^d	80 ^c	128	–
Fleas & Flies							
<i>Ctenocephalides felis</i>	Cat flea	20	72	–	–	24 ^c	–
<i>Musca domestica</i>	House fly	16	80	–	–	22 ^c	15 ^c (0)

(Continued)

(Cont.)							
Lethal accumulated dosages (LAD ₉₉) (oz.-hrs./1000 cu. ft.) of Sulfuryl fluoride for various arthropod species							
Pest		Hours of Exposure	Temp (°F)	Life Stage			
Scientific Name	Common Name			Egg	Larva/Nymph	Pupa	Adult
Grain beetles							
<i>Oryzaephilus surinamensis</i>	Saw-toothed grain beetle	16	80	–	–	–	14 ^c (7)
<i>Rhyzopertha dominica</i>	Lesser grain borer	16	80	219 ^c (14)	–	21 ^c (14)	10 ^c (14)
<i>Sitophilus granarius</i>	Granary weevil	5	77	–	–	–	18 (7)
		16	80	794 ^c (14)	14 ^c (14)	14 ^c (14)	15 ^c (14)
<i>Tenebroides mauritanicus</i>	Cadelle	5	77	–	82 (7)	–	–
<i>Tribolium confusum</i>	Confused flour beetle	5	77	–	–	–	55 (7)
		16	80	1125 ^c (14)	–	–	55 ^c (14)
		24	80	1517 ^c	–	–	–
Moths							
<i>Anagasta kuehniella</i>	Mediterranean flour moth	16	80	–	42 (14)	–	34 ^c (3)
<i>Ephestia elutella</i>	Tobacco moth	16	80	768 ^a (14)	64 ^a (14)	–	–
<i>Sitotroga cerealella</i>	Angoumois grain moth	16	80	87 ^c (14)	24 ^c (14)	–	21 ^c (3)
<i>Spodoptera eridania</i>	Southern armyworm	16	80	363 ^c	–	–	–
<i>Tineola bisselliella</i>	Webbing clothes moth	10	80	280 ^a (14)	70 ^c (14)	–	–
Termites							
<i>Coptotermes formosanus</i>	Formosan subterranean termite	22	81	–	–	–	39 (5)
		4-20	81	–	–	–	48 ^a (3)
		24	86	–	–	–	132 ^a (0)
<i>Cryptotermes cavitrans</i>	–	22	81	–	–	–	37 (5)
		4-20	81	–	–	–	48 ^a (3)
<i>Incisitermes minor</i>	Western drywood termite	22	81	–	–	–	51 (5)
		24	80	–	–	–	47 (5-14)
<i>Incisitermes schwarzi</i>	–	4-20	81	–	–	–	48 ^a (3)
<i>Incisitermes snyderi</i>	–	22	81	–	–	–	46 (5)
<i>Kaloterms approximatus</i>	–	22	81	–	–	–	44 (5)
<i>Neotermes jouteli</i>	–	22	81	–	–	–	36 (5)
<i>Prohinotermes simplex</i>	–	22	81	–	–	–	42 (5)
<i>Reticulitermes flavipes</i>	Eastern subterranean termite	22	81	–	–	–	20 (5)
<i>Reticulitermes tibialis</i>	–	22	81	–	–	–	30 (5)
<i>Zootermopsis angusticollis</i>	Western dampwood termite	22	81	–	–	–	35 (5)
Ticks and Spiders							
<i>Lactrodectus hesperus</i>	Black widow spiders	20	81	300 ^a	–	–	82 (4)
<i>Loxosceles reclusa</i>	Brown recluse spider	20	81	–	–	–	77 (7)
<i>Rhipicephalus sanguineus</i>	Brown dog tick	16	72	–	–	–	186 ^a (2) ^b
		8	81	–	–	–	108
Woodboring beetles							
<i>Euvrilletta pellata</i>	–	18	72	470 ^{a,h}	–	–	–
<i>Hemicoeelus gibbicollis</i>	–	20	72	>500 ^d	87 ^a	–	–
<i>Lasioderma sericome</i>	Cigarette beetle	16	80	–	–	–	15 ^c (14)
		22	80	712 (10)	56 (3)	–	35 (3)
<i>Lyctus brunneus</i>	–	6.5	72	289 ^{a,g}	–	–	–
<i>Lyctus planicollis</i>	Southern lyctus beetle	16	79	512 ^c	–	–	–

^a Lowest LAD (oz.-hrs./1,000 ft³ is equivalent to mg-h/h and g-h/m³) tested resulting in 100% mortality of life stage.

^b Number in parentheses is days after fumigation at which mortality was assessed.

^c LAD₉₅

^d Highest concentration tested; emergence from some eggs/egg cases observed.

^e LAD₉₀

^f Ninth-generation selection of survivors from exposure to sulfuryl fluoride.

^g >2-day-old eggs.

^h >4-day-old eggs.

Source: E.M. Thomas and Scheffrahn, R.H. (1994) "Control of Pests by Fumigation with Vikane Gas Fumigant." DOWN TO EARTH™ 49 (2).

Chapter 2

SAFETY

This product is colorless, odorless and non-irritating to mucous membranes at low concentrations. This product gives no warning of its presence.

This product is toxic and must be handled carefully. Ignoring the potential hazards of this product can result in serious illness or even death.

SYMPTOMS OF POISONING

Symptoms in humans from inhalation exposure to this product will depend on the concentration and the length of exposure experienced. The earliest sign of overexposure to this product is central nervous system (CNS) depression.

Exposure to progressively higher concentrations is expected to result

in convulsions, tremors and/or strychnine-like muscular rigidity.

Humans exposed to high concentrations of this product may experience respiratory irritation, nausea, abdominal pain, CNS depression, slowing of movements and speech and numbness in the extremities. Survival after exposure to high concentrations can occur even following convulsions, if exposure has been brief.

FIRST AID

Refer to the "FIRST AID" section on page 1 of this manual or container label.

In all cases of overexposure, such as nausea, difficulty in breathing, abdominal pain, slowing of movements and speech, numbness in extremities, get medical attention immediately. Take person to a doctor or emergency treatment facility. Have the product container or label with you when calling a poison control center or doctor, or going for

treatment. For information on this pesticide product (including health concerns, medical emergencies or pesticide incidents), call the National Pesticide Information Center at 1-800-858-7378.

NOTES TO PHYSICIAN

Depending on the length of exposure, it is predicted that persons exposed to this product will probably show little evidence of intoxication at first unless the concentration was moderate to high (more than 500 ppm).

Initial effects will probably be depression of the CNS with slow speech and body movement the first signs noted. Convulsions may ensue with respiratory arrest being a terminal event. Assisted respiration may be necessary.

Remove exposed patient to fresh air and put at rest. Keep exposed individual at bed rest and under observation for at least 24 hours. Clinical observation should be directed at the pulmonary, hepatic and renal systems. A postmortem finding in a fatality attributed to sulfuryl fluoride was pulmonary edema. Death was attributed to cardio-respiratory failure.

Also see "FIRST AID" section on page 1 of this manual for additional notes to physician.

There is no known antidote. Clinical observation is essential. Treatment is based on the clinical judgment of the physician and the individual reaction of the patient.

**IN CASE OF EMERGENCY,
CALL 1-877-208-2593.**

**IN CASE OF ACCIDENTAL EXPOSURE,
SEEK MEDICAL ATTENTION.**

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Protective Clothing

Wear splash-resistant goggles or full face shield for eye protection during introduction of the fumigant. Do not wear gloves or rubber boots. Do not reuse clothing or shoes that have become contaminated with this product until thoroughly aerated and cleaned.

Respiratory Protection

If the concentration of this product in the breathing zone of the fumigated area (as measured by a detector device with sufficient sensitivity such as an INTERSCAN, MIRAN or SF-ExplorIR) does not exceed 1 ppm (4 mg/cubic meter), no respiratory protection is required. [A breathing zone is defined as the area within a structure where individuals typically stand, sit or lie down.] If the concentration of this product is greater than 1 ppm, further aeration and re-testing is required. When this concentration is exceeded, or when concentration is unknown, all persons in the exposed area must wear a NIOSH or MSHA approved positive pressure self-contained breathing apparatus (SCBA, not SCUBA) or combination air-supplied/SCBA respirator such as manufactured by Draeger, Ranger, Survivair, Scott, or MSA. Before using any make or brand of SCBA, learn how to use it correctly. Determine that it has an adequate air supply for the job at hand, that it fits properly, providing an adequate seal around the face, and that it is in good working order.

The INTERSCAN must be calibrated according to manufacturer specifications within one month prior to use as a clearance device. All other approved detection devices must be calibrated according to manufacturer specifications.

FIRE FIGHTING Information

This product is not combustible. However, in temperatures exceeding approximately 400°C (752°F), this product will degrade to form hydrogen fluoride (HF) and sulfur dioxide. Theoretically, the number of ounces of HF/1,000 cubic feet produced during a fire in a structure containing this product would equal 0.4x number of ounces of this product per 1,000 cubic feet [in temperatures exceeding approximately 752°F, each mole (102 gm) of sulfuryl fluoride will degrade to form 2 moles (40 gm) of hydrogen fluoride (HF)]. Nonetheless, amounts of HF actually produced during fires involving this product may be insignificant because this product rapidly diffuses from structures.

Use of Water

Evolution of hazardous materials can be minimized by use of water during a fire. Water will scrub out part of the HF and SO₂ formed by decomposition of this product in the flame. Water also can be used to cool cylinders of this product and prevent discharge of the product caused by melted fusible plugs. If possible, avoid runoff into waterways because HF is toxic to fish.

Protective Clothing

Self-contained breathing apparatus (SCBA) and normal "turn-out" gear must be worn when fighting fires in structures under fumigation with this product.

For Fires Involving Cylinders of this Product

When fighting fires in atmospheres containing potentially high concentrations of this product, self-contained breathing apparatus (SCBA) and encapsulating protective suits must be worn. Protective suit material must be compatible with exposure to hydrofluoric acid.

FUMIGANT INTRODUCTION HOSE AND FITTINGS

- Use hose with minimum burst pressure of 3450 kPa (500 psi) that is compatible with liquid Master Fume. Polyethylene or polypropylene hoses have proven satisfactory.
- Use care not to kink or crush the hose. Reinforced hose helps prevent collapse.

PERSONAL SAFETY

- Always wear eye protection when introducing this product or repairing leaks on introduction manifolds or hoses.
- Proper respiratory protection (SCBA) must be on hand in case of required emergency entry into structure.
- Make a security check for personnel, structure preparation and persons in nearby buildings and grounds. Apply proper lock-outs and placarding.

MATERIAL SAFETY

- Use proper fumigant introduction techniques to help prevent corrosion or water stains on interior materials.
- To the extent possible, provide protection for nearby desirable plants.
- Use circuit breakers or fuses for fans.
- To the extent possible, place fans to minimize the risk of damage to equipment.

Chapter 3

CYLINDER

Cylinders of this Product

This product is packaged as a gas under pressure in cylinders. Cylinders contain both gas and liquid. Cylinders containing this product are designed not to explode in high temperatures. A fusible plug in the cylinder valve body melts at 158°F to 165°F (70°C to 73.8°C) releasing the contents of the cylinder.

Cylinder Information

This product is sold as a compressed liquid gas in a high-pressure cylinder and must be handled, stored and transported with precaution. Inspect every cylinder upon delivery for damage. If the cylinder is damaged, immediately return the cylinder to the distributor of this product.

No additional gas is used to pressurize the cylinder. Each full cylinder contains 57 kg (125 lbs.) of product normally under about 1380 to 2070 kPa (200 to 300 psi).

Cylinder Handling

- Avoid manhandling the cylinder when moving or weighing; e.g., use a hoist with a hanging bonnet.
- Protect the valve from damage by always replacing the valve cover and safety bonnet.
- Open valve slowly at first, then completely open it (one full turn) so the valve and the introduction hose do not frost. Use proper size adjustable wrench (25 to 30 cm). Keep wrench attached to valve while valve is open.
- Bear in mind that frosting of the outside cylinder surface when releasing the last 3 to 5 pounds of this product is likely.
- Close valve completely when fumigant introduction is finished or cylinder is "empty."

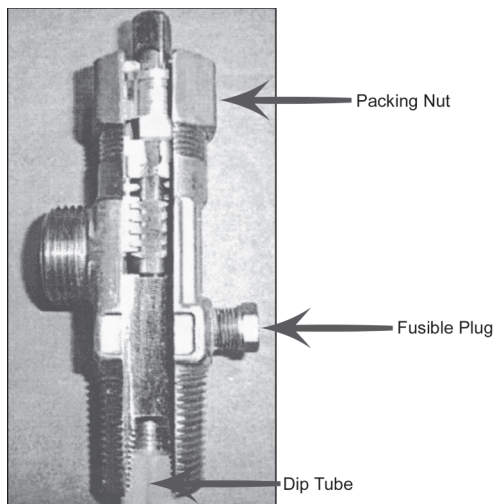
SEE "STORAGE AND DISPOSAL" SECTION AT THE END OF THIS MANUAL FOR STORAGE AND DISPOSAL OF THIS PRODUCT.

Cylinder Valve System

Cylinders of this product are fitted with special valves (see Figure 1). The cylinder is equipped with both a safety cap and a covering called a "bonnet." The safety cap and bonnet must be securely in place at all times except when gas is to be released from the cylinder. This protects the valve system from being damaged and/or prevents accidental release of the fumigant.

Do not hang or lift cylinders by the valves. Use a proper sling to lift cylinders. Use a "hanging" bonnet or other device specifically designed for this purpose when weighing a cylinder on a hanging scale.

FIGURE 1. Cylinder Valve



Leaking Cylinders

If a cylinder is suspected of leaking fumigant, evacuate immediate area of leak. Use a NIOSH or MSHA approved positive pressure self-contained breathing apparatus (SCBA, not SCUBA) or combination air-supplied/SCBA respirator, such as manufactured by Draeger, Ranger, Survivair, Scott, or MSA, for entry into affected areas to correct problem. The SCBA must be worn when exposure is more than 1 ppm or when the concentration is unknown.

Move leaking or damaged cylinder outdoors or to an isolated location, observing strict safety precautions. Work upwind if possible. Do not permit entry into leakage area by unprotected persons until concentration of fumigant in the breathing zone is determined to be 1 part per million (ppm) or less, as determined by a detection device with sufficient sensitivity such as an INTERSCAN gas analyzer [Model: GF 1900], MIRAN vapor analyzer [SapphIRe] or SF-ExplorIR.

Often tightening the packing nut on the top of the valve to 35 to 40 N.m (25 to 30 foot pounds) of torque with an adjustable wrench will stop the leak. Never use excessive force to open a stuck or improperly sealed valve. See valve stem adjustment procedures at the end of this chapter.

Once the cylinder is empty, contact your distributor for proper return instructions.

Frozen Valves and Hoses

If the cylinder valve is "just cracked" to reduce the rate of release, this product will expand from a liquid to a gas within the hose and frosting of the outside of the valve and hose may occur.

FROSTING CAN BE AVOIDED BY ALLOWING FULL FLOW THROUGH THE VALVE AND LINES.

Do not control the rate of flow of this product by restricting flow through the cylinder valve.

Frozen Cylinders

If a break occurs on the dip tube in the cylinder, this product will be discharged in the gas phase when the liquid level falls below the break. As the liquid expands in the cylinder, heat will be taken from the surrounding area and the cylinder will frost or freeze at that point. This product will still be discharged, but at a much slower rate. If cylinder shows signs of a broken dip tube (a very rare occurrence), paint it red on the shoulder of the cylinder, red tag it and return to the distributor so that the problem can be corrected before refilling.

Empty Cylinders

Handle, store and transport empty cylinders using the same precautions as previously discussed for full cylinders. The last 1.5 to 2 kg (3 to 5 pounds) of gas in the cylinder which is the final pounds of this product in a cylinder generally are in a gaseous state and will not move out of the cylinder as rapidly as when it is a liquid. However, it will move through the introduction hose.

REMEMBER TO CLOSE VALVE COMPLETELY ON EMPTY CYLINDERS.

Cylinder Return Policy

When the cylinder is empty, fully close the valve and replace the safety cap and protection bonnet and return the empty cylinder to your distributor. Only Drexel Chemical Company is authorized to refill cylinders. Do not use cylinders of this product for any other purpose.

Transportation of Cylinders

Transport cylinders capped and secured in an upright position. Do not transport cylinders that are unsecured or laying on their side. These are requirements of the Department of Transportation (DOT) when transporting compressed air cylinders. Loose cylinders can become airborne and cause significant damage in an accident.

Because of the toxicity of this product, do not transport cylinders in the same airspace as the driver or other occupants of vehicles, such as in vans or unpartitioned trucks.

Always store and transport cylinders in a secure upright position.

Do not transport cylinders of this product in the same airspace or breathing zone of any area occupied by the driver and other occupants of vehicles.

Consult your local distributor or Drexel Chemical Company for training resources for DOT regulations.

Air Transportation: Never transport cylinders of this product by aircraft.

Valve Stem Adjustments in the Field Introduction

When cylinders are filled at the plant, a soap solution is applied to the valve stem (the square shaft area) and valve threads at the top of the cylinder. The cylinder is not released if leaks are present. Each time the valve is opened and closed, the stem works against the packing causing the packing to flow away from the valve stem. Over time this may allow product to escape past the valve stem when the valve is in the open position. This document describes how this situation can be safely corrected in the field.

Hazards and PPE

Operators performing the valve stem adjustment must follow all precautions on the product label section for "Leak Procedures". This may include, but is not limited to, immediate evacuation followed by reentry using positive pressure self-contained breathing apparatus. Move cylinders outdoors or to a ventilated isolated location prior to adjusting the stem. Allow no unprotected persons in the area during the adjustment procedure until fumigant concentration is verified with sufficiently sensitive detection equipment to be below the levels of concern indicated on the product label.

Indications

This procedure is appropriate when a cylinder shows indication of product loss from around the valve stem. Loss may be indicated either by a sufficiently sensitive detection device or hissing/bubbling at the stem when the valve is open. This procedure may not be effective or appropriate for other valve problems.

Training

Only persons appropriately trained for Hazardous Material handling are permitted to perform this task. While operators who transport this product are required to receive Hazardous Material training, individuals have to check with their employer if they have any questions regarding required training.

Procedure

To stop a loss of this product from around the valve stem in the field, follow the following steps.

Follow directions in "Hazards and PPE" section above prior to starting this procedure. Make sure all PPE and sufficiently sensitive detection devices are used.

1. If product loss is detected, immediately close the valve. This will stop this product from leaking out of the stem.
2. Secure the cylinder against a stationary object (rack, wall, etc.) to prevent tipping. Using the same wrench you use to remove the cap from the valve exit, tighten the packing nut on top of the valve. Turn the packing nut in a clockwise direction to tighten the packing nut. Do not overtighten this nut. The specification is 34 to 40 N.m (25 to 30 foot pounds) of torque, which is easily reached with a 25 to 30 cm (10 to 12") adjustable wrench.
3. Open the valve. If product is still leaking from around the valve stem, repeat steps 1 and 2. If product loss still persists, close the valve, red tag the cylinder and return it for credit. The valve will be replaced at the plant.

Chapter 4

EQUIPMENT

MONITORING EQUIPMENT: FUMISCOPE, REPORTIR™

The monitoring equipment is designed to measure the actual concentration of this product within the fumigation site to determine

accumulated dosage. This equipment is not sensitive enough to use as a clearing device after the exposure period. This equipment also is used in conjunction with Drexel Chemical's Master Fume Calculator for determining actual HLTs.

Fumiscopes can be purchased through your distributor or from the manufacturer.

For more information, contact:

Key Chemical and Equipment Co., Inc.
13195 49th Street N., Unit A
Clearwater, FL 34622
Phone: (727) 572-1159
Fax: (727) 572-4595
Phone: (951) 653-6780

Note: Contact the manufacturer for Fumiscope calibration and repair procedures.

CLEARANCE TESTING EQUIPMENT

A. INTERSCAN GAS ANALYZER

Model GF1900 has an integral pump that draws the air sample through a pyrolyzer (furnace) where the product is converted to SO₂ which then passes through an SO₂ sensor. The unit is lightweight and is battery or AC powered for easy portability.

For more information, contact the manufacturer or:

Key Chemical and Equipment Co. Inc.
13195 49th Street N., Unit A
Clearwater, FL 34622
Phone: (727) 572-1159
Fax: (727) 572-4595

B. MIRAN GAS ANALYZER

The Miran SappHRe utilizes a single beam, infrared detection technology to directly measure low concentrations (0 to 5 ppm) of sulfuryl fluoride.

For more information, contact:

Thermo Environmental Instruments
8 West Forge Parkway
Franklin, MA 02038
Phone: (508) 520-0430
www.thermo.com/AQI

C. SF-EXPLORIR GAS MONITOR

The SF-ExplorIR is a portable monitor that uses non-dispersive infrared (NDIR) technology.

It features direct measurement of sulfuryl fluoride at 0 to 5 ppm.

For more information, contact: Spectros Instruments, Inc. or their representatives.

D. OTHER UNITS

The listed detection and monitoring equipment in this label is not intended to be all inclusive. As new technology is developed, new devices may be evaluated by Drexel Chemical Company to detect this product. Contact your nearest representative from Drexel Chemical Company for the latest information on sufficiently sensitive detection devices.

Prior to using the above instruments to clear a structure for reoccupancy, meters must be "zeroed." This must be done according to the manufacturer's directions, away from the fumigation site and in an atmosphere that does not contain this product. Manufacturer's instructions also include information regarding appropriate and necessary calibration and maintenance. Manufacturer's specifications must be followed to ensure proper operation of these instruments. Please refer to the manufacturer for the latest specifications and instructions for any equipment used with this product.

Chapter 5

BASICS OF STRUCTURAL FUMIGATION PREPARATIONS FOR FUMIGATION

The fumigator must conform to the fumigant label as well as to federal, state and local regulations.

Prior to the parties entering into a fumigation agreement, the Fact Sheet for MASTER FUME gas fumigant must be provided to an adult occupant of the structure to be fumigated or of each currently occupied unit in multi-unit structures. This Fact Sheet is required by the label for this product, and should not be confused with the customer checklist required by some state regulations.

Open operable internal doors, internal openings to attics and sub-areas, storage chests, cabinets, drawers, closets, and appliances (such

as washers, dishwashers, dryers, microwave or conventional ovens, etc.). Using electric fan(s) will help provide for forced distribution and aeration of basements and other dead air spaces to facilitate rapid dispersion of gas. Refrigerator and freezer doors may be left open if the units are turned off or disconnected and all food items have been removed. If the applicator chooses to leave sealed food items in closed refrigerators and freezers during the fumigation, the appliances must be opened when clearing the structure until the concentration of this product in them is 1 ppm or less.

OCCUPANTS/CUSTOMERS NEED TO KNOW:

The following is a list of what could be included on the occupant's notice:

1. Their specific role in preparation for fumigation - what to prepare, what to protect, turn off, remove, etc.
2. What the fumigation process (introduction, exposure, aeration and clearance) entails so that there can be absolutely no entry by unauthorized personnel into the structure until it is certified clear for reentry by the fumigator.
3. The specific times to leave the structure and when re-occupancy may occur.
4. That the fumigator often requires that the property owners surrender keys to the structure to be fumigated. The fumigator should have access to all areas of the fumigation site during the whole period that the site is under their control.
5. Potential problems like:
 - I) Damage to plants too near the house for proper tarping or plants included within the fumigation space.
 - II) Damage to highly sensitive plants.
 - III) Damage to old or otherwise fragile roofs (especially tile), TV antennas, fences, etc.
 - IV) Excellent efficacy of the fumigation, but lack of residual effectiveness to control future infestations of pests.

WHAT TO REMOVE PRIOR TO FUMIGATION

Remove from the structure to be fumigated all persons, domestic animals, pets and desirable growing plants.

Domestic animals and pets do not include feral animals, which include domesticated animals that have reverted to a wild condition and are not legally owned by any person(s). If pets, domestic or feral animals are observed or known to occupy areas of the structure to be fumigated, the fumigator and property owner need to determine whose responsibility it will be to remove, trap or otherwise exclude these animals from the structure prior to the fumigation. The applicator must inform occupants and owners of the following: 1) to notify nearby neighbors of the date of fumigation; 2) to keep pets away during the fumigation; and 3) to close off any open access to the subarea to prevent pets from entering. This should assist in vacating the structure of pets, domestic and feral animals prior to the fumigation.

Remove fish tank containing live fish, or remove the fish, or develop a plan for preparing the tank for fumigation. If necessary, exclude water in the tank and biological filters, if present, from the fumigated space by sealing with gas resistant tarps or sheeting. If water aeration is required during the fumigation, provide fresh air from outside the fumigated space for the tank aerator. Remove mattresses (except waterbeds) and pillows completely enveloped in waterproof covers or remove covers (or open seal of waterproof covers). Food, feed, drugs, tobacco product, and medicinals (including those items in refrigerators and freezers) can remain in the structure if they are in unopened plastic, glass or metal bottles, cans or jars with the original manufacturer's air-tight seal intact. Food, feed, drugs, tobacco products, and medicinals (including those items in refrigerators and freezers) not in plastic, glass or metal bottles, cans, or jars with the original manufacturer's air-tight seal intact, need to be removed from the fumigation site, or double bagged in Master Fume bags, Nylofume® bags or Fumiguard bags, which are available from distributors of these products. Opened items that do not need to be removed or sealed in Nylofume bags include dental hygiene products (including toothpaste, mouthwash, dental adhesives, and dental whitening products), cosmetics including lipstick, all externally applied lotions and ointments, ice and water.

FLAMES OR HEATING ELEMENTS

This product is a very stable compound that is relatively non-reactive and non-flammable. Under high heat conditions present in gas flames or glowing electric elements, however, this product can decompose into sulfur dioxide SO₂, hydrofluoric acid HF, and other decomposition products. Hydrofluoric acid is highly reactive and can corrode or damage many materials including metals, glass, ceramic finishes,

fabrics, etc. Extinguish all flames, including pilot lights of water heaters, gas refrigerators, ranges, ovens, broilers, dryers, gas fireplaces, etc. Turn off or unplug all electrical heating elements such as those in heaters, pianos, organs, etc. Shut off automatic switch controls for appliances and lighting systems that will be included in the space to be fumigated.

Contact your local gas company to determine what procedures to follow in your area for shutting off natural gas or propane service. Clear the gas lines. Fumigation companies may request that customers have the local gas company turn off the gas prior to fumigation. The local gas company needs to turn the gas service on after it has been turned off to determine that the gas flow rate and pressure are appropriate. CHLORINE GAS: Damage to metals can also occur from the inclusion of chlorine gas for bleaching or chlorination processes. Ensure this equipment is turned off with no leaks or excluded from the fumigation.

WETTING THE SOIL

Prior to the tarping time (generally the day before the fumigation), some fumigators require that the occupants or owners wet the soil for the tarp seal. Often, this can accomplish the necessary "sealing" of the soil and, if done properly, will not cause puddling or muddy conditions at tarping time. Do not water or treat the sub-area of crawl space structures for subterranean termites immediately prior to a fumigation. Wet sub-area should be allowed to dry before fumigation. Enclosing the structure in a tarp can cause the moisture to be confined and accumulate within the structure during the fumigation period, leaving condensation and/or an odor problem.

DISTRIBUTION/AERATION FAN

(Also see Chapter 6 on Fumigant Introduction).

Distribution

Introduce this product into a structure in such a way that it reaches equilibrium rapidly. The exposure period does not begin until equilibrium has been reached. Rapid mixing of fumigant with the atmosphere of the structure also helps prevent formation of pockets of chilled air, which can produce fogging, especially if the atmospheric humidity is high. The introduction of this product must be directed into the air stream of the fan for best distribution.

A fan or combination of fans must have a capacity of at least 1,000 cfm for each pound of this product released per minute.

Electricity is needed to operate fans during fumigation introduction and aeration. If electricity is not available on the property to be fumigated, the applicator must make alternate arrangements, such as having a generator or securing power from a neighbor.

MONITORING HOSES

(See Chapter 7 for information on monitoring this product.)

SEALING THE STRUCTURE

The fumigator must conform to the label and this manual for use of this product, as well as to federal, state and local regulations. When in doubt, a fumigator has to seek assistance from suppliers, regulators, Drexel Chemical Company representatives or other educational sources.

The quality of the seal has a huge influence on the effectiveness of the fumigation. Increasing the seal of the fumigation site is one of the most effective ways to ensure a quality fumigation and reduce the total amount of fumigant needed.

Tape and Seal

For fumigation structures that can be appropriately sealed with materials such as plastic or tape, seal adequately around doors, windows, vents and other openings.

Often, structures are too large to be completely tarped for fumigant confinement. The most common practices are to use polyethylene sheeting, non-porous panels, tape, spray adhesives, foams and insulation materials to seal the structure for fumigation. These techniques are usually used around doors, windows, roof eaves, loading docks, pipes, augers, conveyors, vents, etc. If properly used, these materials can do an ample job of confining the fumigant within the structure.

Stucco or masonry block buildings may be sealed by taping plastic film over outside doorways, windows and vents. With this method, as with tape, partitions may interfere with fumigant distribution. When tape is used for sealing, particularly if a subsection is involved, a recirculation fan is required, unless proper amounts of fumigant are introduced separately into each compartment to assure an adequate concentration of gas. Do not use sealing method for houses in which any wooden section, including roofing, is exposed to the outside. Always monitor with a Fumiscope or similar device when necessary.

Tarping

Tarpaulins (tarps) can be used in the sealing process with tapes/adhesives to help seal leaky areas or to envelop the entire area to be fumigated. This method is effective on almost any size or type of space/site. The ability of a tarp to contain a gas depends on the condition of the tarp, the material of construction and its thickness.

Open windows before tarping to aid in the distribution of the fumigant between the tarps and the structure. Open attic and subsection vents during fumigation, as well as interior doors, cupboards, drawers, washers, dryers and ovens. (Always comply with local regulations concerning barriers to entry into the structure during the exposure period.)

One of the most critical operations is achieving a tight seal in tarping a structure at the ground where protrusions, debris or rough-textured soil or concrete may provide an opening for gas to escape. If the ground surface is very smooth, sand or water snakes may be used effectively. When necessary to minimize escape of fumigant through the soil and to avoid injury to nearby plants, wet soil (if not sufficiently moist) around the structure to act as a barrier for the fumigant.

To improve tarp seal, uneven or rough-textured soil surface should be evened with soil or wet sand. Grass, mulch or rocky surfaces make poor seals.

Allow tarp to clear the ground snakes to achieve an adequate ground seal. This will accommodate movement of the tarps due to wind movement.

Tarp Material

Plastic tarps are semi-permeable membranes that permit different fumigants to pass through them at different rates. The passage of this product through most plastic sheeting of sufficient thickness is very slow.

Use only tarps made of materials that will adequately confine this product for the required time. Tarps are sold in many sizes. Experience has shown that the following have proven satisfactory:

1. 4 to 6 mil polyethylene for "single use" tarps
2. Laminated (several layers) polyethylene
3. Vinyl coated nylon
4. Neoprene coated nylon
5. PVC (polyvinyl chloride) coated nylon

Thickness

As a minimum, 4 to 6 mil (160 to 240 microns) thickness of the above materials adequately confines this product. A tarp of 100 microns is equivalent to a 400-gauge material. Polyethylene tarps less than 4 mil (160 microns) are not of an adequate thickness to confine this product because they do not possess the strength and weight needed for the handling, wind resistance and abrasion encountered in most fumigations.

PLACARDING, USE OF CHLOROPICRIN AND SECURING FUMIGATED AREAS

PLACARDING OF FUMIGATED AREAS

This product is a toxic gas without a warning agent.

All entrances and all sides of the fumigated environment and any connected area must have warning signs.

The warning signs must be printed as follows:

- | |
|---|
| <ol style="list-style-type: none">1. The signal word DANGER/PELIGRO and the SKULL and CROSSBONES symbol.2. The statement, "Area under fumigation, DO NOT ENTER/NO ENTRE".3. The date of fumigation.4. Name of fumigant used.5. Name, address, and telephone number of the applicator. |
|---|

Only a certified applicator may authorize removal of placards, and only when the concentration of this product in the breathing zone of the treated site is 1 ppm or less.

Use the following considerations when posting warning signs:

- A) Follow local, state and federal regulations for sign format, size, durability or additional information requirements.
- B) Use materials that will allow information to remain legible when posted.
- C) Use information that allows for 24 hour communication with the certified applicator in the event of an emergency.

USE OF CHLOROPICRIN

Also required by label is the proper use of the warning agent, chloropicrin. This is an essential part of security against improper entry (see Chapter 6 for proper chloropicrin placement and rates).

Tarped structures must have proper circulation and exposure to the fumigant.

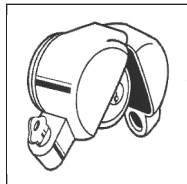
Windows are not considered normal entries and must be opened for the fumigation. However, the risk of illegal entry has to be considered in the plans for securing valuables during the fumigation.

SECURING STRUCTURES

In order to secure against unauthorized entry during the fumigation exposure period, a locking device or barricade must be used on all exterior doors or doorways. A locking device, such as a secondary lock, or barricade must be demonstratively effective in preventing an exterior door or doorway from being opened from the exterior using normal opening or entering processes by anyone other than the certified applicator in charge of the fumigation or persons in his/her on-site direct supervision. Consult state and local regulations for any supplementary instruction and local restrictions on securing against entry.

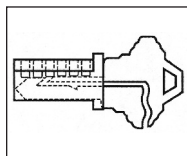
Several additional security options to consider might include:

1. Locks



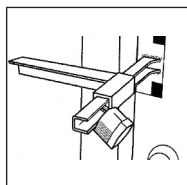
a) CLAM SHELL LOCKS

CLAM SHELL LOCKS are designed to prevent use of the door or occupant's keys to unlock entrance doors.



b) KEY-WAY LOCKS

KEY-WAY LOCKS are designed to prevent use of the occupant's keys to unlock entrance doors. These function by inserting a two-part locking key into the door keyhole and removing only half of the key. The other half of the locking key remaining in the door prevents insertion of the occupant's key.



c) J-SAFE LOCKS

J-SAFE LOCKS or chains can also be used on certain structures.

d) CHAINS

CHAINS can also be used on certain structures.

Pins and staples in keyways are not recommended unless they are the only option and can only be removed with a special tool.

2. Guards

Guards may be considered in some circumstances and may be required in some locations. Consult local regulations.

3. Barricades

4. Caution tape similar to that used on construction sites.

5. If a fence encircles the fumigated structure, posting no trespassing signs on gateways/entrances.

Chapter 6

DOSAGE, CHLOROPICRIN WARNING AGENT, INTRODUCTION OF FUMIGANT CALCULATING DOSAGE

Drexel Chemical's Master Fume Calculator

Drexel Chemical's Master Fume Calculator program is used for all fumigations using this product. See directions for details and specific use. Do not use this product without the Drexel Chemical's Master Fume Calculator. Drexel Chemical's Master Fume Calculator must be used to calculate the dosage. Drexel Chemical's Master Fume Calculator program may be modified and updated from time to time; please contact your Drexel Chemical Company representative for current information.

Fumigant Dosage

All fumigants utilize some form of the dosage relationship which is often referred to as the "CT Concept":

$$\text{Dosage} = \text{Concentration (C)} \times \text{Time (T)}$$

or

$$D = C \times T \text{ (CT)}$$

Therefore, the dosage required to kill the target pest(s) is accumulated over a period of time and is measured in ounce-hours or gram-hours.

$$\text{CT} = \text{oz.-hr./1000 cu. ft.}$$

The concentration in ounce per 1000 cubic foot of fumigant is multiplied by the exposure time in hours.

The maximum target concentration in Drexel Chemical's Master Fume Calculator is 128 ounces per 1000 cubic foot.

Concentration Units of this product
1 ounce per 1000 cubic foot = 240 ppm

USING DREXEL CHEMICAL'S MASTER FUME CALCULATOR PROGRAM

Drexel Chemical's Master Fume Calculator is a program that requires entry of key information to determine the dosage and amount of this product to be used. The calculations take into consideration a broad range of pest species life stages and varying conditions of individual fumigation.

The program determines the dosage for monitored and non-monitored fumigations of exposure periods from 2 to 72 hours. The program will calculate the estimated half-loss time, dosage of product per 1,000 cu. ft., the pounds of the fumigant required, ounce-hours required and the maximum shoot rate per minute, and the amount of chloropicrin required.

(Refer to the table on pages 4 and 5 of this manual for lethal accumulated dosages of this product for various pests.)

Drexel Chemical's Master Fume Calculator program information requires that the dosage range is from 0.5X to 10X the dosage for drywood termites, dependent on the target pest.

The tarp condition and seal inputs are: Excellent, Good, Medium, Fair or Poor. This input would be in relation to age and condition of the tarps used and how well a ground seal could be achieved.

Input Info

Dosage	: 1 – 10
Tarp condition	: Excellent – Poor
Seal condition	: Excellent – Poor
Wind (mph)	: 0 – 25
Volume (mcf)	: 1 – 5000
Underseal	: Slab, clay, loam, sandy loam, sand
Temperature (°F)	: 40 – 100
Hours exposure	: 2 – 92
% Relative humidity	: 10 – 95
Amps per fan	: 1 – 10
Pic rate	: 10 or 15
Monitor job	: No or Yes

Output Received

Estimated half-loss time
Dosage as ounce per 1,000
Gas required as pounds
Ounce-hour required
Maximum shoot rate as pounds per minute
Ounces of Pic needed

Using Drexel Chemical's Master Fume Calculator When Monitoring

During the exposure period, the concentration of this product can be measured by a Fumiscope or similar device. After the fumigant concentration has reached equilibrium, measurements taken over an interval of time will give the actual loss rate from which the HLT can be determined. Use of Drexel Chemical's Master Fume Calculator during monitored fumigations has shown that significant quantities of this product can be saved compared to unmonitored fumigations and better control achieved. Refer to Drexel Chemical's Master Fume Calculator help file for specific directions on how to use this program. Drexel Chemical's Master Fume Calculator is designed to determine actual HLT based on measurements of concentrations of this product during fumigation.

Monitoring to Determine Status and Updated Dosing

1. Measure (with a gas measuring instrument such as a Fumiscope or similar device) concentration of this product ounce per 1000 cubic foot (gm/m³).
2. After one or more hours, take a second measurement of concentration of this product. Accuracy of HLT increases as time between monitoring intervals is increased.
3. Drexel Chemical's Master Fume Calculator will calculate the actual measured HLT.
4. If the HLT is shorter than estimated (more rapid loss of fumigant), then either more of this product needs to be added to finish on time or the exposure time may be extended if sufficient product is present. Drexel Chemical's Master Fume Calculator will provide the time and "add gas" specifications.

CHLOROPICRIN WARNING AGENT

Because this product is odorless, protective chloropicrin warning agent must be released at least 5 to 10 minutes within the structure or site before the fumigation begins. This is a precaution to assure that the space to be fumigated remains free of people.

When applying chloropicrin at multiple chloropicrin introduction points within a structure, start at the point farthest from the exit and work toward the exit.

Applicators must observe the chloropicrin precautionary statements and personal protective equipment appearing on this label.

Chloropicrin Personal Protective Equipment

Some materials that are chemical-resistant to this product are neoprene rubber \geq 14 mils. For more options, follow the instructions for category D on the chemical-resistance category selection chart.

- All persons applying chloropicrin must wear:
 - long-sleeved shirt and long pants,
 - chemical-resistant gloves, and
 - protective eyewear or face shield (DO NOT wear goggles).
- Persons applying chloropicrin must wear either a positive pressure self-contained breathing apparatus or combination air-supplied/SCBA when applying chloropicrin to more than two chloropicrin introduction points within a single fumigated structure.
- The employer of any person applying chloropicrin must make sure that they are provided and correctly wear the required PPE. Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

Chloropicrin First Aid

If inhaled:

- Move person to fresh air. Keep warm.
- If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible.
- Do not give anything by mouth to an unconscious person.
- Call a Poison Control Center or doctor for further treatment advice.

If on skin or clothing:

- Immediately remove contaminated clothing, shoes or any other item on skin.
- Rinse skin immediately with plenty of water for 15-20 minutes.
- Call a Poison Control Center or doctor for treatment advice.

If in eyes:

- Hold eye open and rinse slowly and gently with water for 15-20 minutes.
- Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.
- Call a Poison Control Center or doctor for treatment advice.

If swallowed:

- Call a Poison Control Center or doctor for treatment advice.
- Have person sip a glass of water if able to swallow.
- Do not induce vomiting unless told to do so by a poison control center or doctor.
- Do not give anything by mouth to an unconscious person.

Introduction of Chloropicrin

Studies have shown that when chloropicrin is applied according to label directions, it will reach warning concentration by the time the fumigant is introduced and will maintain a warning concentration throughout the fumigation period. In order for chloropicrin to perform effectively, it must be applied:

- In a container with fresh wicking material.
- In the air stream of a fan.
- At a rate of 1 fl. oz. per 10,000 to 15,000 cubic feet or follow dosage rate calculated by the electronic Master Fume Calculator system.

- Do not fill chloropicrin pan or any pan with more than 3 fl. ozs. of chloropicrin.

- Wait 5 to 10 minutes before introducing Master Fume.

Also, it is suggested that introduction of chloropicrin should be:

- At least one on each floor of a multi-story structure.
- At each fumigant introduction site.
- The most effective placement of chloropicrin is about 1 foot behind the fan with the fan positioned upward at a 45-degree angle.

To avoid problems with desorption of chloropicrin, a fumigator may disqualify areas with many furnishings on which chloropicrin can absorb.

Exceptions of Use

The exceptions to the use of chloropicrin can be made when used on fumigation chambers, temporary and permanent, including but not limited to vehicles, trucks and trailers, shipping containers, storage pods. Also, when fumigating passenger railcars when meeting the following requirements:

- A thorough walk through inspection must be performed of each railcar with doors being locked immediately upon leaving each car. Post a guard during fumigation introduction, exposure period, and aeration. Because a guard is posted, application of a warning agent is not required for passenger railcars.
- When the exception is used on fumigation chambers, temporary and permanent, vehicles, trucks and trailers, shipping containers or storage pods, a guard is not required, unless required by state regulations, if barricade(s) or locking device(s) that are demonstratively effective in preventing the fumigated space from being entered by normal means by anyone other than the certified applicator in charge of the fumigation or persons under their direct supervision on site.
- Due to unknown effects of chloropicrin on sensitive items such as museum artifacts or evidence in police storage, the use of chloropicrin may not be possible. In these situations, the use of chloropicrin can be waived but must be approved by the state regulatory authority and alternative safety precautions must be included such as guarding the fumigated site.

Use Information for Chloropicrin

1. Although chloropicrin is an excellent warning agent, it must not, however, be relied upon as deterrent to entry during the fumigation. Follow all label, local and state regulations such as:
 - Performing a final inspection to ensure no persons, pets, or domestic animals are present prior to fumigant introduction, and structure entrances are secured, and warning signs are posted. Follow any additional state or local regulations that may be required.
2. The amount of chloropicrin MUST be accurately measured. Measuring devices with a graduated scale for fluid ounces and reclosable caps are available. An additional advantage of using these devices is that chloropicrin can be measured outside the structure so only the amount of chloropicrin needed during the fumigation is carried into the structure.
3. Store and transport chloropicrin and measuring container in a gas-tight case outside of the driver's space. Refer to the Department of Transportation for further instructions on transporting chloropicrin.
4. Chloropicrin is persistent when adsorbed on wood or concrete. DO NOT use in fumigant introduction hose for this product or pour on concrete or soil.
5. Chloropicrin is an organic molecule with a very high boiling point and low vapor pressure relative to this product. These characteristics contribute to its tendencies toward sorption and slow desorption, and require specific procedures for chloropicrin introduction.

Follow the following sequence, for each chloropicrin introduction site, after preparing the structure for fumigation:

1. Accumulate the appropriate quantities of chloropicrin. To assist with accurate measurement of chloropicrin, measuring devices with resealable/recloseable caps are available (SCC Products, Anaheim, CA. Phone 714-761-3292). The advantage of using these devices is that chloropicrin can be measured outside the structure so only the amount of chloropicrin needed during the fumigation is carried into the structure.
2. Make sure that wicking material, such as a handful of cotton, is present in each container.
3. To distribute the chloropicrin, place the container in front of or behind the fan with adequate cfm rating.

- Pour chloropicrin over the absorbent material. The measuring container and cap may be left near the container and residues allowed to evaporate.
- Leave the area immediately if protective respiratory equipment is not being used.
- Seal the last entrance after application of chloropicrin.
- If not already started, start the fan(s).

IMPORTANT: Chloropicrin is a warning agent that causes smarting of the eyes, tears and discomfort. It has a very disagreeable pungent odor at very low concentrations. Chloropicrin must be used by a person certified to apply MASTER FUME or under their supervision. Fumigators must observe the precautionary statements and personal protective equipment appearing on this label.

INTRODUCTION OF FUMIGANT USING THE CYLINDER

This product is supplied in cylinders equipped with tubes that extend from the bottom of the tank to a valve on the top. To release the fumigant, this valve is opened to permit a free flow of the liquid, which vaporizes as it escapes from the release hose.

The last 3 to 5 pounds of fumigant in the cylinder will turn to gas before moving through the hose and the rate of flow is thus markedly reduced. During this phase, the cylinder and hose will often become frosted or iced. Care should be taken to keep this melting frost from dripping onto household furnishings.

Turn the valve fully open. Initially, turn the valve slightly open until flow has begun and then opened about one full turn, which should give full flow through the 1/8" fumigant introduction hose. When finished, close the valve tightly using a wrench. A clearance detector or leak detector may be used to test for a tight seal at the connections.

Also refer to Chapter 3 of this manual for additional information on cylinder.

WEIGHING THE FUMIGANT

Either platform or hanging scales can be used to weigh the cylinder containing this product during introduction of the fumigant. In the event that hanging scales are used, modified bonnets or cylinder slings should be used to hang the cylinder from the scale.

Never suspend the cylinder by the valve!

See Chapter 3 of this Manual for additional information.

Consult Drexel Chemical Company or your MASTER FUME distributor for a source of supply.

Routinely calibrate the scale regardless of its type to assure continued correct readings. Refer to the scale manufacturer for further details.

RELEASING THIS PRODUCT

Worker Safety

When releasing this product from the cylinder, the operator must wear face shield or goggles. Do not wear gloves or rubber boots. Since there is a potential for the fumigant introduction hose to detach from the cylinder, all onlookers must remain at a safe distance from the release site. See Chapter 3 of this Manual for more information.

Preventing Damage to Property

The minutely small quantity of impurities in this product is of no consequence when it is correctly introduced and maintained in the gas phase. These impurities can cause damage and accelerate corrosion if a fogout occurs during fumigant introduction, resulting in condensation on susceptible objects; i.e., metals, tile, glass, fabrics, etc.

Reaching Equilibrium

When this product is released as a liquid from the fumigant introduction hose, it becomes very cold as it expands to form a gas and chills the surrounding air as the two mix.

This chilling causes formation of a fog that must be dissipated. The rate of dissipation depends upon the rate of release, atmospheric conditions and the mixing rate (which is determined by fan number, type and placement). Because it is chilled, this product in air is much more dense than the surrounding air and will rapidly settle to the bottom of the fumigation space unless mechanically agitated.

All gases tend to move from an area of high concentration to low concentration and will, therefore, come to equilibrium in a confined space. This product will do the same when it is introduced into a fumigation space, regardless of the fact that molecules of this product are heavier than air molecules. In spite of the high vapor pressure of this product, the rate of passive diffusion may be too slow for this to occur within the practical time of a fumigation. Thus, good mechanical distribution, such as the fans, is essential.

Substantial fans are needed when introducing this product for the following reasons:

- To prevent stratification.
- To aid proper dispersion.
- To assist temperature distribution.

FUMIGANT INTRODUCTION – SELECTION AND USE OF EQUIPMENT

Hoses

Release the fumigant through a suitable leak-proof hose with a minimum burst pressure of 500 pounds per square inch (psi). In addition, the dimensions of the fumigant introduction hose can have a large influence on the efficacy and material safety of this product.

The introduction rate of this product is controlled largely by the inside resistance of the fumigant introduction hose. The effects of the inside diameter size on the flow rate of this product and the effect of hose length on the introduction site are shown in the following tables.

EFFECT OF INSIDE DIAMETER SIZE ON FLOW RATE OF THIS PRODUCT THROUGH A 25 FT. HOSE OF POLYETHYLENE AT 65°F	
TUBE INSIDE DIAMETER (ID)	LBS. OF THIS PRODUCT PER MINUTE
1/8	4
1/4	20
1/2	45

EFFECT OF HOSE LENGTH (1/8" ID) ON THE FLOW RATE OF THIS PRODUCT	
LENGTH (FEET)	LBS. OF THIS PRODUCT PER MINUTE
25	4.0
50	2.8
100	2.0*

* Where fumigant introduction rates lower than 2 lbs./min. are needed, a longer hose can be used (e.g. 200 ft.).

Fumigant Introduction Stand

A raised fumigant introduction stand can be constructed of PVC pipe. Attaching the hose to customer furnishings is not recommended because these items may be damaged if contacted by tape or liquid of this product.

Another widely used solution is to securely tape the introduction hose to a tarp clamp, and then use the tarp clamp to attach the hose to the fan cage. In this case, the fan cage is angled 45° upward. Also, successful introduction of fumigant has been obtained by attaching the introduction hose to a coiled sand snake in front of an up-angled fan at 45°.

Always leave the introduction hose in place during the exposure period, rather than attempt to pull the hose out following introduction. Pulling the hose out can result in significant damage to furnishings or the structure.

Protective Sheeting

Protective sheeting, such as polyethylene plastic under the stand, hose and fan, may be used to further protect floors and floor coverings during application. All of the options outlined above for fumigant introduction offer the flexibility to incorporate protective sheeting in critical areas.

Chloropicrin Introduction

Chloropicrin must be used within the structure at least 5 to 10 minutes prior to the introduction of the fumigant. Place a handful of cotton in a container and set the container in the air stream of a fan. Use 1 fl. oz. per 10,000 to 15,000 cubic feet of space to be fumigated. (See section on Chloropicrin in this chapter for additional information).

Fumigant Introduction Site

The specific site of release of this product is very important to the success of the fumigation. Introduce this product in a manner to achieve rapid equilibrium, avoid excessive loss due to stratification and ensure safety to personnel and materials. Usually this can be accomplished by directing the flow into the air stream of fan(s) that has the capacity of 1,000 cfm for every pound of this product introduced per minute.

Considerations for Site Selection

- Largest space.
- At least one location at each floor of a multistory structure.
- Proximity of furnishings that might be damaged by introduction.

4. Since it is suggested that chloropicrin be applied at each introduction site for this product, consideration should be given to the furnishings in each site. If the furnishings in a given area are such that chloropicrin desorption may be a problem (overstuffed furniture, many boxes, pillows, excessive clutter, etc.) the fumigator may want to disqualify the said area as a potential chloropicrin application site.
5. Number of sites: Studies support a fumigant introduction site for each 20 to 40 Mcf in a single-family dwelling.

Site selection is made using common sense. Ask, "If this product was introduced in this location, how and when will it get to the most remote locations in the structure?" It may be necessary to use multiple introduction sites to rapidly attain equilibrium. As a rule, it is not necessary from an efficacy standpoint to introduce fumigant directly into the attic space. With proper site selection and fan placement, this product will reach equilibrium throughout the structure and will not stratify in the lower reaches of the building.

Purpose and Choice of Fans

There are three purposes for fans in a structural fumigation: 1) fumigant control, 2) circulation, and 3) aeration.

Fans ensure that the fumigant equilibrium is achieved in a timely manner, and aid in the ventilation and aeration process.

When selecting a fan, check the manufacturer's specifications and ensure that the fan meets or exceeds this label cfm requirements. Other considerations when selecting a fan would be to use fans that are UL Listed, grounded and have a thermal shut-off switch. It is best to use a commercial fan that has a shield or metal housing for protection. Generators should be provided to run the fans if the fumigation site is not equipped with electricity.

Fan Capacity

Direct a fan into the open attic access for aeration.

The fan(s) used to introduce this product must have the ability to move at least 1,000 cfm (cubic feet per minute) of air per 1 pound of this product released.

For aeration of this product, you must have a fan or fans that have a total combined capacity of 5,000 cfm and if/they must operate for at least one hour.

Positioning Fans

Direct a fan into the open attic access for aeration. There is no set pattern established for the positioning or the number of fans to use. A rule of thumb has been to use one fan for each 20 to 45 Mcf and at least one fan for each floor of the structure, including sub-areas (basements) and open attics, if accessible. Fans should be positioned in such a way that the fumigant will be mixed rapidly to reach equilibrium.

It is good fumigation practice to use more fans in structures that are divided into numerous smaller compartments or rooms.

Distribution and Aeration

Introduce this product into a structure in such a way that it reaches equilibrium rapidly, since the exposure period does not begin until equilibrium has been reached. The number of fans will accumulate the calculated hours of exposure by reaching equilibrium in the estimated time (usually one hour in an average house). The fumigant introduction fan(s) will mix the warm air of the structure with the cool air during introduction of this product and act as a "heat exchanger".

For best distribution, the introduction of this product should be directed into the air stream of the fan. If you elect to shoot with the air stream, choose a large open space and tilt the fan to a 45° angle or greater. The fan must have a capacity of at least 1,000 cfm for each pound of this product released per minute.

As noted in Chapter 8, fans are equally important during the aeration process of the fumigation. Depending on the size, compartmentalization, actual HLT and terminal concentration, fan placement will be critical during active ventilation. Often, the fans will need to be repositioned for aeration. The best use of the aeration fan(s) is to position them so airflow is moving in one direction. Position fans for fresh air intake in openings on one side of the structure and fans for exhausting fumigant in openings on the opposite side of the structure.

CONTINUOUS CIRCULATION

After this product reaches equilibrium, introduction fans can be turned off remotely. Often, fans are left on during the fumigation to assist with ventilation of the fumigant during aeration.

All fumigants leak. The ground seal and tarp condition play a role in confinement. Unless there are abnormally large leaks, continuous circulation during the entire exposure period will not appreciably affect the loss rate for this product.

Electricity is needed to operate fans during fumigation introduction and aeration. If electricity is not available on the property to be fumigated, the applicator must make alternate arrangements, such as having a generator or securing power from a neighbor.

Frozen Valves and Hoses

When liquid of this product is released from the confinement of the cylinder, it quickly expands into a gas because it boils at -55°C (-67°F). Like evaporating water, it absorbs heat from the surrounding material. The amount of heat needed from the air to evaporate one pound of this product is 20,460 calories. The loss of this amount of heat will chill 1,000 cubic feet of sea-level air about 4.5°F for every pound of this product released.

If the valve is "just cracked" to reduce the rate of release, this product will expand from a liquid to a gas in the hose. When this happens, a chilling and consequent frosting of the outside of the valve and hose occurs. This is avoided by allowing full flow through the valve. Control the rate of flow of this product by the inside diameter (ID) and length of hose, and not by restricting flow through the valve.

ENTERING A STRUCTURE UNDER FUMIGATION

If emergency entry into a structure under fumigation with this product is required, proper respiratory protection, Self Contained Breathing Apparatus (SCBA), must be used. See Precautionary Statements (Personal Protective Equipment) section of the label of this product.

Chapter 7

MONITORING THIS PRODUCT

Monitoring discussed within this chapter refers to measuring the actual HLT and oz-hr dosage accumulation during the fumigation exposure. Monitoring a fumigation is not required by the label for this product, but may be requested by a customer or by regulatory officials in certain conditions for verification of oz-hr dosage accumulation.

Measurement of the accumulated concentration of this product while the fumigation is in progress becomes increasingly valuable as the structure size, complexity and the repercussions of poor pest control increase.

Guidelines for monitoring a fumigation:

1. Monitor this product in spaces most representative of the atmosphere in the structure. In large jobs, more sampling points may be necessary. If present and accessible, monitoring can also be conducted in the attic and/or crawlspace to determine fumigant distribution throughout the structure.
2. In structures with partitions or poor air circulation, samples should be taken from the separate sections, such as living space, subsection, attic, each floor of multiple story structures or each unit in a partitioned building such as apartments.
3. The time required between measurements to determine the actual HLT will depend upon the fumigant confinement. Allow for sufficient time between readings to detect a change in the fumigant concentration. Usually two to four hours will be adequate, but in the case of structures with excellent confinement, more time may be required.
4. To confirm the total oz-hr dosage accumulated, the fumigated space will need to be monitored at two time intervals occurring approximately at equilibrium and prior to aeration.

EQUIPMENT

Master Fume Calculator Program

Master Fume Calculator program can be used for both non-monitored and monitored fumigations. Master Fume Calculator may also be used for monitored fumigations.

Monitoring Hoses

Monitoring hoses for sampling fumigant concentrations should be placed in the structure prior to fumigant introduction. Semi-rigid hoses typically 1/8" to 1/2" ID are used. Monitoring hoses larger than 1/2" ID may take a longer time to pull the sample from the fumigated space to the monitoring device because of the larger volume of air needed to be moved.

MONITORING A LARGE FUMIGATION

Place monitoring lines on all levels of the fumigated structure, including attics and sub-areas, if accessible. At least half the lines should be placed in rooms/areas distant from fumigant introduction points. If the structure is compartmentalized into separate towers, wings or other sub-units, place lines in areas representative of different sub-units. Monitoring can be conducted, if time permits, in a manner so that the exact amount of this product required is introduced based on the measured half-loss time (HLT). This type of precision fumigation is

conducted by initially introducing a portion of the calculated dosage of this product, monitoring to determine the actual HLT, and then adding this product to achieve sufficient ounce-hours in the time remaining for the fumigation.

Chapter 8

AERATION AND REENTRY

AERATION

It is essential that no occupant reenter the structure after fumigation until the fumigant has been aerated and the space has been fully tested and cleared for reentry.

Plan ahead for the aeration period. Take steps to aid in aeration by placement of fans strategically and by placing seams away from outdoor plants. To facilitate aeration, open operable internal doors, internal openings to attics and sub-areas, storage chests, cabinets, drawers, closets and appliances such as washing machines, dryers, dishwashers, ovens and other enclosed areas. Refrigerator and freezer doors may be left open if the units are turned off, but if they remain closed for the fumigation, they will need to be opened during clearing.

FACTORS INFLUENCING AERATION TIME

Four Factors Affect The Time Needed For Aeration:

1. Rate of air exchange
2. Terminal fumigant concentration
3. Load factor – sorption/desorption and diffusion rate
4. Temperature

PROCEDURES FOR AERATION

Procedures available to the fumigator for aeration may vary depending on the State. Refer to the label registered in the State or contact your Drexel representative for further information.

Aeration Procedure 1

These steps must be completed in succession.

- Step 1:** Aerate structure with all operable windows and doors open, aided by the use of 1 or more fans, for a minimum of 1 hour. Total fan capacity, using one or more fans, shall be capable of displacing a total of 5,000 cfm.
- Step 2:** Secure structure and do not allow reentry for a minimum of 6 hours from the start of aeration (first opening of the seal). During this time, structures must remain posted.
- Step 3:** After the minimum 6 hour waiting period, measure the concentration of this product in breathing zones of each room. If the concentration of this product is greater than 1 ppm, further aeration and re-testing are required. If the concentration of this product is above 1 ppm, ventilate structure with operable doors and windows open. Structure may be reoccupied when concentration of this product is 1 ppm or less in the breathing zones.

Aeration Procedure 2

These steps must be completed in succession.

- Step 1:** Aerate structure with all operable windows and doors open, aided by the use of 1 or more fans, for a minimum of 1 hour. Total fan capacity, using one or more fans, shall be capable of displacing a total of 5,000 cfm.
- Step 2:** Secure the structure and do not allow reentry for a minimum of 8 hours from the start of aeration (first opening of the seal). During this time, the structure must remain posted.
- Step 3:** After the minimum 8 hour waiting period, measure the concentrations of this product in breathing zones of each room. If the concentration of this product is greater than 1 ppm, further aeration and re-testing are required. If the concentration of this product is above 1 ppm, ventilate structure with operable doors and windows open. Structure may be reoccupied when the concentration of this product is 1 ppm or less in the breathing zones.

When using Procedures 1 and 2, at least a full hour of active ventilation is required to aerate the structure with operable doors and windows open with the aid of one or more fans to enhance fumigant diffusion and to prevent fumigant concentrations from exceeding 1 ppm following clearance. The applicator may increase the total aeration period beyond a total six to eight hours for ease in scheduling. **During the initial one-hour aeration procedure, approved respiratory protection must be worn until the concentration of this product is confirmed not to exceed 1 ppm with an approved detection device.** Since the INTERSCAN, MIRAN [SaphIRe] and

SF-ExplorIR give immediate readings, respiratory protection is not required when clearing with these instruments after having completed the initial one hour aeration procedure. If a reading indicates levels in excess of 1 ppm, leave the affected area immediately.

To confirm a fumigant concentration of 1 ppm or below in the breathing zone, the structure must be tested with a detection device of sufficient sensitivity such as Interscan gas analyzer, Miran or SF-ExplorIR at the end of the aeration period. Further aeration and re-testing are required if the concentration is found to be more than 1 ppm in the breathing zone.

Use Restriction: The structure is considered under fumigation until final clearance is obtained. During this time, appropriate precautions are still needed.

No one is allowed in treated areas if the level of this product is above 1 ppm, or if the level of this product is unknown, unless provided with a NIOSH or MSHA approved positive self-contained breathing apparatus (SCBA, not SCUBA) or combination air supplied/SCBA respirator such as manufactured by Ranger, Survivair, Scott or MSA.

SAFETY CONSIDERATIONS AT AERATION

At the time of the start of aeration, two trained persons in the use of this gas fumigant must be present. The "opening" of a fumigation has to be done in such a way that there will be minimal exposure of the crew, neighbors and non-target areas to the fumigant.

Use proper respiratory equipment described in the "Personal Protective Equipment (PPE)" section of this product label if entry into the fumigated area is necessary prior to the completion of the initial full hour aeration procedure or when the fumigant concentrations are not known. Proper respiratory equipment must be worn until detection devices have confirmed that aeration has reduced the fumigant concentration to 1 ppm or less in the breathing zone.

Entrances of fumigated structures must remain posted with warning signs until the level of the fumigant in the breathing zone of the treated areas is found to be 1 ppm or below as determined by a detection device of sufficient sensitivity such as Interscan, Miran or SF-ExplorIR. This includes the time allowed for extended aeration. Removal of the warning signs may only be authorized by a certified applicator, and only when the concentration of this product in the breathing zone of the treated site is 1 ppm or less. Consult your local authorities regarding documentation pertaining to notices on posting clearance.

CLEARING THE STRUCTURE

It is important that after fumigation, no occupant reenter the home, vehicle or other fumigation site until the fumigant has been aerated and the site has been tested for fumigant clearance.

The fumigator must test the breathing zones in the structure, following aeration period, to make certain that the concentration of this product is 1 ppm or below in the breathing zones before allowing reoccupation of the structure.

DETECTION OF FUMIGANT

It is the responsibility of the licensed fumigator to measure the concentration of this product using a detector with sufficient sensitivity such as the ones described in Chapter 4 of this manual under "CLEARANCE TESTING EQUIPMENT".

Aeration is not considered complete until the level of sulfuryl fluoride has been determined to be no more than 1 ppm in the breathing zone with an appropriate detection device. Warning signs must remain posted on the structure at each entrance until aeration is determined to be complete.

Chapter 9

CHAMBER, VEHICLE, AND VESSEL FUMIGATIONS CHAMBER FUMIGATIONS

Load chambers and stacks so that adequate air movement can occur around fumigated items to allow even distribution of the gas.

REQUIREMENTS FOR EQUIPMENT

The requirements for equipment to be used with this product are similar to those used with methyl bromide.

Atmospheric Chambers

A suitable pressure atmospheric fumigation chamber consists of a sufficiently gas-tight room with an appropriate door. For gas distribution, an application system, exhaust fan and a small circulation fan are recommended.

The size of the exhaust fan will depend on the size of the fumigation chamber and aeration time requirements. A fan capable of changing the air in the chamber in 5 to 10 minutes is generally sufficient. Local

representatives of the various fan manufacturers can be of assistance in determining the size required. The chamber should exhaust this product away from adjoining buildings or work areas. Consult your state agency for emission control requirements.

Vacuum Chambers

Vacuum chambers require special designs which take into account the vacuum pressure exerted on the materials of construction. For this reason, trained engineers need to be consulted before constructing a vacuum chamber. Follow all directions given by the manufacturer or design engineer.

Specially built steel chambers for vacuum fumigations provide the fastest and most effective fumigation. After the commodity is placed in the chamber, pumps evacuate air. This product is introduced and rapidly penetrates all space previously occupied by air. A lethal dosage of this product results when the proper concentration is maintained for the required fumigation period.

A vacuum of 25 to 27 inches Hg is commonly drawn for vacuum fumigations. It is advisable to check to ensure that the vacuum is maintained according to plan. Unplanned vacuum release indicates leakage. Note that some vacuum fumigations are planned to allow release of the vacuum during exposure with the objective of improving penetration of the commodity as air enters the chamber.

PREPARATION FOR CHAMBER FUMIGATION

Load chambers in a way to allow for adequate air movement around commodities, and even distribution of the gas.

FUMIGANT INTRODUCTION

Atmospheric Pressure Chambers

Atmospheric fumigation chambers are easy to operate. Close the trap door to the exhaust fan after loading the chamber. Turn on the circulating fan and close, tightly, the front door. Place warning signs to alert people that fumigation with this product is in process. Introduce the required dosage of this product and check with a monitoring device to determine that no leakage is occurring during fumigation (see Chapters 6 and 7). Follow the manufacturer or design engineer's operation procedures due to the special design of vacuum chambers. Respiratory protection is required for all personnel in immediate area if, for any reason, the chamber must be opened before aeration is complete or leak occurs.

Vacuum Chambers

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AERATION OF CHAMBER

Vacuum Chamber

Release the vacuum at the end of the exposure. For reentry purposes, purge the chamber of air/fumigant two times by pulling a partial vacuum prior to checking the gas concentration.

FOR BOTH ATMOSPHERIC AND VACUUM CHAMBER FUMIGATIONS:

- Load chambers so that adequate air movement can occur to allow distribution of the fumigant.
- Application of chloropicrin is not required for chamber fumigations if the chamber 1) can be inspected prior to fumigant introduction to confirm that all persons, domestic animals, and pets have been vacated and 2) is secured to prevent the chamber door from being opened using normal opening or entering processes by anyone other than the certified applicator in charge of the fumigation or persons in his/her on-site direct supervision.
- An introduction fan/circulation fan is recommended when introducing this product into chambers to distribute fumigant throughout the chamber. However, if a sufficient open space is not available or if use of an introduction fan is not practical, an introduction/circulation fan is not required. Introduce the fumigant in a manner to avoid a fog-out slowly and not apply the liquid form of this product to the surfaces of fumigated commodities.
- Aeration of this product from the chamber head space is generally very rapid, but desorption from fumigated items can occur for a longer period of time. Always check for the concentration of this product with a suitable detector before entering the chamber without proper respiratory protection (SCBA). It is advised to keep the exhaust fans running during the aeration period and also while unloading the chamber. Only the certified applicator can authorize the removal of warning

signs when it has been determined that the concentration of this product in the chamber head space is 1 ppm or less.

Contact Drexel Chemical Company or its representatives for consultation regarding any specific question regarding construction of fumigation chambers.

CLEARING AND REENTRY

This product aerates rapidly. The fumigator, however, must always check with a gas detector to determine the concentration of gas in the chamber before reentry. Unless the sulfuryl fluoride concentration is 1 ppm or below, DO NOT reenter without respiratory protection. Keep the exhaust fans running during the aeration period and also while unloading the chamber. Remove the warning signs only when aeration has been completed and the area has been determined safe to enter (see Chapter 8).

TARPS AS CHAMBERS (“STACK FUMIGATIONS”)

Tarp can act as a chamber when fumigating items. Place items on an airtight foundation, such as another tarp or on concrete, and cover with a fumigation tarp so as to ensure a tight seal. Support the tarp over the items to create about 2 feet gas expansion dome above items and allow at least 1 foot of space around the sides for the gas to diffuse. The edge of the tarp must be sealed by placing weights at edges with sand or water “snakes” or equivalent.

Conduct tarp fumigations out-of-doors or in a building that will not be occupied during fumigation and aeration periods. If it is to be conducted in a building used for purpose other than fumigation, the requirements for structural fumigation must be followed (e.g. removal of people, food, pets and plants, use of warning agents, posting of warning signs, etc.). Procedures for structural fumigation must be followed.

If the fumigation chamber is in a structure or enclosure that requires the gas to be released from inside that structure or enclosure, then it is a must that the applicator and other persons in the area wear proper respiratory protection. A positive-pressure, self-contained breathing apparatus (SCBA, not SCUBA; Section 2) or air-supplied/SCBA respirator must be used. Also, an additional person trained in the use of the product must be present.

Dosage is calculated using the Master Fume Calculator program. Please note that the HLT of fumigations in which tarps act as chambers are difficult to estimate, thus, it is recommended to monitor the fumigation using a Fumiscope.

Prior to releasing the fumigant, post warning signs on the tarps as specified in Chapter 5.

If the tarpaulin fumigation is inside a building, the building must be locked and posted outside at all entry points with warning signs to prevent unauthorized personnel from entering the building during fumigation and aeration period.

When the fumigation period is over, open the tarp by pulling back slightly. Leave for at least 30 minutes to allow the fumigated material to air out before removing the cover. If this is done in an enclosure/structure, then proper respiratory protection must be used as with introducing the gas. Fan(s) is recommended to hasten the aeration, especially when fumigation is done in an enclosure.

DO NOT enter the fumigation site during fumigation or aeration period without proper respiratory protection. DO NOT move the items until the area has been cleared to 1 ppm or below using a suitable detection device (Chapter 4) and warning signs have been removed.

VEHICLES, VESSELS, AND CONTAINERS

This product is not registered for the treatment of aircraft or underwater vessels.

This product may be used for fumigating passenger railcars and empty and loaded shipping containers, trucks, automobiles, buses, recreational vehicles (including campers and trailers), surface ships, and other transport vehicles or vessels in essentially the same manner as small structures. Monitoring these fumigations is recommended since the HLT may be difficult to estimate using the Master Fume Calculator system. Automobiles may remain in garages that are being fumigated; however, the applicator must be able to inspect all areas of the vehicle (including the trunk) prior to fumigant introduction.

In-transit fumigation (including aeration) of any vehicle is prohibited on public roads or waterways. Do not move any vehicle while under fumigation.

Follow all local, state and federal regulations covering the fumigation of vehicles and vessels.

Selection of Fumigation Location

Place vehicles, containers, and vessels in a location that is appropriate for conducting a fumigation away from other work areas. Small

pleasure boats may either be removed from the water and fumigated on land or fumigated in the water. Large vessels, such as houseboats, and ocean-going vessels, such as freighters and cruise ships can be fumigated in the water at dockside.

Securing the Vehicle, Vessels, or Container

To prevent entry by unauthorized person, secure the vehicle using normal means during the fumigation. It is also advised that vehicle be secured by setting the brakes and blocking the wheels so that the vehicle will not move during the fumigation and aeration periods.

Surface Ships

Follow all local, state, and federal requirements for ship fumigation, including those required by the United States Department of Transportation, Chapter 1, Parts 147A.1-147A.43 in the Code of Federal Regulations, Section 46 Shipping and the label for this product. Since the codes listed are for fumigants in general, do not use procedures that are not permissible for this product as directed by label instructions and regulations. The certified applicator and ship's captain or owner shall follow the requirements listed on the label for this product and local and state requirements. Except for those persons involved in the fumigation, no unauthorized persons may be onboard during fumigation.

Fumigation of Vessels on Water

If vessels are sealed by tarping, it is common practice to extend the tarps below the water surface, unless restricted by local or state regulations, taking into consideration the change in water level in tidal water and how this may affect tarps sealed around lines mooring the boat to the dock. Water acts as an excellent barrier for this product because of its low water solubility. When using the Master Fume Calculator to estimate HLT for fumigations in water, experience has demonstrated that using the slab rating to describe the water underseal is appropriate.

Securing Procedures For Passenger Railcars

For securing railcars, follow either Procedure 1 or Procedure 2 below.

Procedure 1: A thorough walk through inspection must be performed of each railcar with doors being immediately locked upon leaving each car. Post a guard during fumigation introduction, exposure period, and aeration. Because a guard is posted, application of a warning agent is not required for passenger railcars.

Procedure 2: A thorough walk through inspection must be performed of each railcar with doors being immediately locked upon leaving each car. If no guard is posted, then apply a warning agent following instructions per label directions. To secure the passenger railcar against unauthorized entry during the fumigation exposed period, use a locking device or barricade on all exterior doors or doorways. A locking device or barricade must be demonstrably effective in preventing an exterior door or doorway from being opened using normal opening or entering processes by anyone other than the state licensed applicator in charge of the fumigation or persons in his/her on-site direct supervision. Consult state and local regulations for any supplementary instructions and local restrictions on securing against entry.

AERATION PROCEDURES FOR PASSENGER RAILCARS

Passenger railcars may be aerated using either of the following two aeration procedures (railcars must remain posted until cleared for re-occupancy):

Aeration Procedure 1:

If on-board railcar ventilation systems are not operable, aerate railcar for a minimum of 6 hours using the following steps:

- Step 1:** Remove all tape, seals, and/or tarps.
- Step 2:** Open all exterior railcar doors.
- Step 3:** Open all internal doors such as cabinets, closets, appliances and sleeping berths,
- Step 4:** In sleeper cars, turn all mattresses askew to expose cavities beneath sleeping berths.
- Step 5:** Ventilate the railcars for a minimum of 1 hour with enough portable fans to provide a minimum 4,000 cfm capacity per floor. A bilevel railcar would require 8,000 cfm capacity or greater - 4,000 cfm per floor. Direct fans in such a manner to create cross-ventilation of railcar.

Step 6: After the minimum 6-hour aeration time, railcars may be re-occupied when the concentration of this product is 1 ppm or less with all doors and windows closed and ventilation

systems turned off as measured by a detection device with sufficient sensitivity such as an INTERSCAN, MIRAN [SaphIRe], or SF-ExplorIR.

Aeration Procedure 2:

If on-board railcar ventilation systems are operable, actively ventilate the railcar for a minimum of 2 hours using the following steps:

- Step 1:** Remove all tape, seals, and/or tarps.
- Step 2:** Open all exterior car doors.
- Step 3:** Open all internal doors such as cabinets, closets, appliances and sleeping berths.
- Step 4:** In sleeper cars, turn all mattresses askew to expose cavities beneath sleeping berths.
- Step 5:** Turn on all on-board Heating, Ventilation, Air-Conditioning (HVAC) systems and exhaust fans.
- Step 6:** In sleeper cars, turn on all operable wall or ceiling mounted fans.
- Step 7:** Ventilate the railcar with enough portable fans to provide a minimum 4,000 cfm capacity per floor (in addition to on-board systems). A bilevel railcar would require 8,000 cfm capacity or greater - 4,000 cfm per floor. Direct fans in such a manner to create cross-ventilation of railcar.
- Step 8:** After the minimum 2 hours active ventilation/aeration, the railcar may be reoccupied when the concentration of this product is 1 ppm or less with all doors and windows closed and ventilation systems turned off as measured by a detection device with sufficient sensitivity such as an INTERSCAN, MIRAN, [SaphIRe], or SF-ExplorIR.

For more detailed information on the source and use of air monitoring devices or respirators, consult the Master Fume Manual for Structural Fumigation. Do not reoccupy fumigation site, i.e., vehicle, or move vehicle until aeration is complete. Warning signs must remain posted until aeration is determined to be complete.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

PESTICIDE STORAGE: Store in dry, cool, well ventilated area under lock and key. Post as a pesticide storage area. If the storage area is in an occupied building, the storage area must have either 1) a forced air ventilation system that meets required local ordinances for the storage of hazardous materials and operates continuously; or 2) be equipped with a permanently mounted and properly maintained and functioning sulfuryl fluoride monitoring device designed to alert occupants of the building if sulfuryl fluoride in the air of the storage area is greater than 1 ppm. Store cylinders upright secured to a rack or wall to prevent tipping.

PESTICIDE HANDLING:

Do not subject cylinders to rough handling or mechanical shock such as dropping, bumping, dragging, or sliding. Do not transport any cylinders in closed vehicles where they occupy the same common airspace as personnel. Transport securely only in an upright position.

Do not remove valve protection bonnet and safety cap until immediately before use. Replace safety cap and valve protection bonnet when cylinder is not in use.

When cylinder is empty, close valve, screw safety cap onto valve outlet, and replace protection bonnet before returning to supplier. Only the registrant is authorized to refill cylinders. Do not use cylinder for any other purpose. Follow registrant's instructions for return of empty or partially empty cylinders.

LEAK PROCEDURES: Evacuate immediate area of leak. Use a NIOSH or MSHA approved positive pressure self-contained breathing apparatus (SCBA, not SCUBA) or combination air-supplied/SCBA respirator, such as manufactured by Ranger, Survivair, Scott, or MSA, for entry into affected areas to correct problem. Move leaking or damaged cylinder outdoors or to an isolated location, observing strict safety precautions. Work upwind if possible. Do not permit entry into leakage area by unprotected persons until concentration of fumigant is determined to be 1 ppm or less in the breathing zone, as determined by a detection device with sufficient sensitivity such as an INTERSCAN, MIRAN or SF-ExplorIR.

(Continued)

STORAGE AND DISPOSAL (Cont.)

CYLINDER AND PRODUCT DISPOSAL:

Promptly return all empty cylinders to your distributor of this product. Follow proper cylinder handling directions above.

Pesticide wastes are toxic. Improper disposal of excess pesticide is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, consult your State Pesticide or Environmental Control Agency, or the Hazardous Waste Representative at the nearest EPA Regional Office for guidance.

WARRANTY DISCLAIMER

Drexel Chemical Company warrants that this product conforms to the chemical description on the label and based upon tests believed reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. To the extent consistent with applicable law, Drexel Chemical Company makes no other expressed or implied warranty of merchantability or fitness for a particular purpose or any other express or implied warranty.

Use Risk

It is impossible to eliminate all risks associated with use of this product. Plant injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to label instructions (including conditions noted on the label, such as unfavorable weather, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of Drexel Chemical Company or the Seller. To the extent consistent with applicable law, all such risks shall be assumed by Buyer.

Limitation of Remedies

To the extent consistent with applicable law, the exclusive remedy for losses or damages resulting from this product (including claims based on contract, negligence, strict liability, or other legal theories), shall be limited to one of the following at Drexel Chemical Company's discretion:

1. Refund of purchase price paid by Buyer or use for product bought, or
2. Replacement of amount of product used.

To the extent consistent with applicable law, in no case shall Drexel Chemical Company or the Seller be liable for consequential, special or indirect damages or losses from the use, handling, or storage of this product.

The terms of the "Warranty Disclaimer" above and this "Limitation of Remedies" cannot be varied by any written or verbal statements or agreements. No employee or sales agent of Drexel Chemical Company or the Seller is authorized to vary or exceed the terms of the "Warranty Disclaimer" or this "Limitation of Remedies" in any manner.



Manufactured For:
Drexel Chemical Company

P.O. BOX 13327, MEMPHIS, TN 38113-0327

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