

2021 Florida

Fumigation Manual

Thomas Chouvenc, Ellen Thoms, Sean Brantley and William H. Kern

Executive editor: Rudolf H. Scheffrahn



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FLORIDA FUMIGATION MANUAL

Second Edition (2021)*

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Executive editor and contributor Rudolf H. Scheffrahn

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Cover Photo: A large mansion, “the Floridian,” under sulfuryl fluoride fumigation in southeastern Florida.



This manual is dedicated to Jeff Edwards (1959-2021)

He performed the fumigation showcase for the 'UF School of structural fumigation' more than anyone else, and was dedicated to training the next generation of fumigators

Jeff was part of the team that performed the fumigation of the structure displayed on the cover of this manual

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Foreword

This manual is a guide to help prepare for the Florida Department of Agriculture and Consumer Services (FDACS) structural fumigation state examinations for Certified Operators (CO) and Special Identification Cardholders (SPID) [482.151]. Therefore, this manual does not cover all the regulations involved with structural fumigation (Structural Pest Control Act, Chapter 482 of the Florida Statutes [482] and 5E-14 of the Florida Administrative Code [5E-14], which can both be found at the end of this manual), but instead primarily focuses on the information expected during state examination procedures. It is advised for licensees to fully be aware of the entirety of FDACS regulations, and not simply rely on the material presented in the current manual to run the operations of their business. Finally, this manual contains standard procedures that most fumigators in the state have adopted because of state regulations or because they make good technical or economic sense. While this manual provides a series of technical recommendations, it does not intend to dictate how to perform structural fumigation. It is imperative that fumigators abide by the product labeling, and follow all local, state, and federal laws, while using safe practices when performing a fumigation.

Disclaimer

The use of trade names in this publication is solely for the purpose of providing specific information. UF/IFAS does not guarantee or warranty the products named, and references to them in this publication do not signify our approval to the exclusion of other products of similar composition.

News regulations, labeling, and registrations can occur at any time, and, when implemented, could make part(s) of the current version of this manual obsolete. Please check for updates at <https://flrec.ifas.ufl.edu/florida-fumigation-manual/>

Information about the UF School of Structural Fumigation (“Fume School”) can be found at <https://conference.ifas.ufl.edu/fumigation/>

List of Abbreviations

CEU: Continuing Education Units

CO: Certified Operator

EPA: United States Environmental Protection Agency

EUP: Experimental Use Permit

FDACS: Florida Department of Agriculture and Consumer Services

FDOT: Florida Department of Transportation

FFDCA: Federal Food, Drug and Cosmetic Act

FID: Employee identification cardholders with a Fumigation Identification Card endorsement

FIFRA: Federal Insecticide, Fungicide, and Rodenticide Act

FMP: Fumigation Management Plan

HBr: Hydrogen Bromide

HF: Hydrogen Fluoride

HLT: Half Loss Time

MB: Methyl Bromide

MB Q: Methyl Bromide for Quarantine

NAI: New Active Ingredient

PH: Metallic Phosphide

PPE: Personal Protection Equipment

PPQ: Plant Protection and Quarantine

QAR: Quality Assurance Reviews

RUP: Restricted Use Pesticides

SCBA: Self-Contained Breathing Apparatus

SLA: State Lead Agency

SF: Sulfuryl Fluoride

SLN: Special Local Needs

SNU: Significant New Use registrations

SPID: Special Identification cardholder

APHIS: United States Department of Agriculture-Animal and Plant Health Inspection Service

WDO: Wood Destroying Organism

Use of splash box in this manual

- Important -

Additional information not in the FDACS state examination for fumigation, but enforced by other agencies.

- Keep in Mind -

Refers to good practices or highlights items that are subjects of confusion.

- Checklist -

List of actions or items required in a specific part of the fumigation process.

Chapter 1

Introduction

Structural fumigation is unlike any other category of modern pest control. It demands that a sequence of procedures be conducted in varying, and often, difficult physical environments using toxic gases and an assortment of heavy, costly, and specialized equipment. Fumigation is the only method of pest control that allows for complete and rapid eradication of target organisms within a defined space. Structural fumigation is a needed and rewarding profession in which the skill, precision, and creativity of the fumigator are constantly challenged.

As a result of Florida's tropical climate, it is home to a greater diversity of structural and household pests than any other state. Among the target pests of structural fumigation are drywood termites, wood-boring beetles, bed bugs, aerial infestations of subterranean termites, and the occasional problematic household insect, spider, or rodent infestation. More than 60,000 structural fumigations are conducted annually in Florida with the majority targeting drywood termites.

At one time, methyl bromide (MB) was a widely used fumigant, including for fumigation of residences. During the 1990's, studies began appearing that suggested the earth's stratospheric ozone layer was thinning and MB was determined to have ozone-depleting properties. In 1992, the United Nations Environment Programme, under their Montreal Protocol, agreed to gradually phase-out the use of MB. The current MB Q labeling (Q for Quarantine) only permits quarantine and regulatory uses under the supervision of a regulatory agent (See [Table 1-1](#)). Two sulfuryl fluoride (SF) products, Vikane® (Trademark of Douglas Products) and Zythor® (Trademark of Ensystex), are now used for all residential structural fumigations in Florida and the U.S. These two SF products are classified and regulated as residential fumigants in Florida [\[5E-14.102 \(20\)\]](#) because they are the only fumigants in labeled for application to residential structures (i.e., dwellings) in addition to many other types of buildings, vehicles, structures, and materials ([Table 1-1](#)). In addition to MB, various phosphine formulations and one SF product, ProFume® (Trademark of Douglas Products), are used for fumigation of food commodities and structures that store, process, and transport these commodities ([Table 1-1](#)). This manual reviews the use of metallic phosphides; aluminum and magnesium phosphide, which generate phosphine gas in the presence of water moisture. Phosphine can also be applied directly to a commodity as a gas from metal gas cylinders or phosphine generators. These phosphine gas products are rarely used in Florida by fumigators under the Chapter 482 certification (See State Regulation, Certification, and Examination later in this chapter), so their use and application requirements are not reviewed in this manual.

In addition to the loss of MB for structural fumigation, many other significant changes have also occurred in the structural fumigation industry since 2005, especially in its regulation. These changes include the US Environmental Protection Agency (EPA) reducing the SF exposure limit to 1 ppm, requiring fumigant manuals be part of the labeling, and revising application procedures

for the warning agent chloropicrin, Florida enacting stewardship requirements for registrants of and fumigators using residential fumigants, and industry developing new SF clearance (i.e., low concentration) devices. All structural and commodity fumigants are currently under registration review by the EPA, so additional changes in fumigant labeling are anticipated as these reviews are completed

Table 1-1. Label-permitted fumigation sites and commodities for sulfuryl fluoride (SF) fumigants, methyl bromide (MB) and metallic phosphides (PH).

Label-Permitted Fumigation Sites and Commodities	Fumigants			
	SF Residential Fumigants (Vikane® and Zythor®)	SF Commodity Fumigant (ProFume®)	MB Quarantine "Q" gas ¹	Metallic (Aluminum and/or Magnesium) Phosphides ²
Residential buildings	Yes	No	No ³	No
Food handling establishments ⁴	Not prohibited, but exposure of food is not permitted	Yes	Yes	Yes
Stationary transportation vehicles ⁵	Yes	Yes	Yes	Yes
Permanent and Temporary Chambers ⁶	Yes	Yes	Yes	Yes
Vacuum chambers	Yes	Yes	Yes	No
Passenger railcars	Yes	No	No	No
In-transit railcars	No	No	No	Yes
In-transit surface ships	No	No	Yes	Yes
Grain, nuts, dried fruit, herbs, and other durable food commodities.	No	Yes	Yes	Yes
Fresh fruits and vegetables, and other perishable food commodities	No	No	Yes	Select magnesium phosphide formulations only
Live plants, bulbs, corms, tubers, rhizomes, and roots	No	No	Yes	No
Seeds for propagation	No	Yes	Yes	Yes
Tobacco	No	No	Yes	Yes
Non-food products and commodities ⁷	Yes	Yes (SLN labels)	Yes	Yes

¹ For regulatory and quarantine use only; requires supervision by a regulatory agent.

² For "yes", check if site and/or commodity is permitted by specific labeling for metallic phosphide based on active ingredient and formulation.

³ MB labeling also prohibits application in nursing homes, hotels, dormitories, schools, hospitals, and public restaurants.

⁴ Includes pet food facilities, bakeries, food production facilities, mills, and warehouses.

⁵ Includes railcars, surface ships, trucks, etc. but NOT aircraft.

⁶ Includes normal atmospheric chambers, shipping containers, trailers, indoor and outdoor tarped stacks.

⁷ Check product labeling for types of non-food products and commodities that can be fumigated. ProFume has Special Local Needs (SLN) labels in numerous other states (not currently Florida) to fumigate a variety of non-food commodities.

It remains unlikely that any new fumigant will be discovered in the future. The relatively small pool of candidate molecules available does not include a single gas with some, or even a few, of the many desirable properties needed for a structural fumigant. Unfortunately, structural fumigation is the only branch of pest control that is publicly implicated in non-operator human fatalities. Continuous enhancements to fumigation regulations have been made to prevent entry by normal means or ensure evacuation of fumigated structures. The use of warning signs, secondary locks and barricades, walk-through inspections, and chloropicrin application procedures have undoubtedly saved lives. Fumigators must continue to strictly adhere to all federal and state safety requirements to prevent accidental exposures.

In this manual, use and application of SF residential fumigants (Vikane and Zythor) and of the warning agent chloropicrin are reviewed in detail because most fumigators taking the state certification exam primarily use these SF fumigants. Commodity fumigations using MB, PH, and the SF commodity fumigant (ProFume) constitute only a small fraction of non-soil fumigations in Florida because the State is not a significant producer of stored food products such as dried fruits, nuts, or grains. Many commodity fumigations in Florida are conducted as quarantine treatments of agricultural products at seaports. Important aspects of the use and application of the commodity fumigants are reviewed in each chapter of this manual.

The purpose of the current manual is to provide a single updated study reference for the safe, effective, and lawful practice of fumigation in Florida. This manual contains standard procedures that most fumigators in the State have adopted because they are required by law or because they make good technical or economic sense. No two companies in Florida conduct fumigations in exactly the same manner. It is not the intent of this manual to dictate how a fumigator accomplishes his/her task, only that he/she uses safe practices to control the target pest, abides by the product labeling, and follows all local, State, and federal laws

Why Fumigate?

The great advantage of structural fumigation over other methods of pest control is that all target pests are killed within the confined, fumigated space, regardless of their location. Fumigants follow all the physical laws of gases; therefore, their molecules diffuse freely through air and infiltrate the minutest of spaces. One disadvantage of fumigation is the lack of residual activity to protect the fumigated space from subsequent infestation.

When to Fumigate?

Structural fumigation is the treatment of choice when the target pest infestation cannot be fully accessed or delineated, when there is evidence of a structural infestation, but the source is unknown, or when the target pest must be eradicated because of a quarantine issue. Fumigations can be conducted at any time of year for rodents. However, when fumigating for insects in structures, the minimum temperature at the pest target site must be at least 40° F.

How to Fumigate?

The procedures for lawful, safe, and effective fumigations are described in this manual.

State Regulation, Certification, and Examination

The practice of commercial pest control in Florida is strictly regulated under the provisions of the Structural Pest Control Act, Chapter 482 of the Florida Statutes [482] and 5E-14 of the Florida Administrative Code [5E-14]. These laws and regulations are administered and enforced by [the Florida Department of Agriculture and Consumer Services](#) (FDACS) In addition to administrative offices in Tallahassee, FDACS has field inspectors and supervisory personnel located throughout the state to assist in enforcement activities.

The inherent dangers in structural fumigation are recognized in State law and authorize FDACS to issue an immediate stop-use or stop-work order for fumigation performed in violation of fumigant labeling requirements or department rules, or in a manner that presents an immediate serious danger to the health, safety, or welfare of the public, including, but not limited to, failure to use required personal protective equipment, failure to use a required warning agent, failure to post required warning signs, failure to secure a structure's usual entrances as required, or using a fumigant in a manner that will likely result in hazardous exposure to humans, animals, or the environment [482.051(6)]. If a stop order (FDACS form 13659) is issued, work cannot be resumed until corrections are made, verified, and the release section of the stop order is completed by FDACS [5E-14.108(4)]. The Certified Operator (CO) in charge must notify FDACS within 24 hours of any accidental human poisoning or death connected with fumigation or any pest control work performed on a job they are supervising [482.152(6)].

State law authorizes one business licensing program (Pest Control Business License) and certification programs that include a Pest Control Operator's Certificate Program. Pest control within the meaning of this law includes all phases of structural fumigation [482.021(22)]. Each pest control business location must be licensed by FDACS and the pest control operations of the business location must have a designated CO(s) in charge [482.071]. To issue a business license, the candidate must first either obtain a certificate for each category they plan to perform services in through certain qualifications, working experience, and examination [482.132], [482.141], or obtain the services of a person already certified [482.071(2)(e)].

The CO must be certified in the category (or categories) in which the business wishes to operate, must have a primary occupation in the pest control business, and must be employed on a full-time basis by the licensed firm [482.152]. Presently, the available categories are: General Household Pest and Rodent Control, Termite and Other Wood-Destroying Organisms Control, Lawn and Ornamental Pest Control, and Fumigation. Pest control operator's certificates are issued to persons who pass the written examination(s) given by FDACS. The minimum qualifications for CO examination in fumigation are three years employment as a service employee of a licensee that performs fumigation, or completing a designated number of college level courses in pest control entomology, or related subjects plus one year employment as a service employee of a licensee that performs fumigation [482.132(2)].

A CO in charge of fumigation must train and/or verify training to each special identification cardholder (SPID) in proper fumigation procedures as required by regulations and fumigant labeling directions, and to know the location, purpose, use and maintenance of personal protective equipment and fumigant detection and safety devices and when and how to use this equipment. The fumigation CO must also train each identification cardholder, assigned to

fumigation (e.g., with a Fumigation Identification Card endorsement) in basic fumigation procedures, self-contained breathing apparatus (SCBA) use, the proper use of fumigant safety equipment, and to report immediately to the CO in charge or his SPID any irregularities or emergencies [5E-14.108 (3)].

In 2002, the Pest Control Enforcement Advisory Council was created within FDACS. Appointed by the Commissioner of Agriculture for a 4-year term, the 11-member panel is to advise the Commissioner on regulatory and enforcement policy of Florida's pest control industry [482.243]. The Council is composed of representatives from FDACS, the pest control industry, the scientific community, and a private consumer with the goal of ensuring industry enforcement and compliance, consumer protection, and public understanding of the pest control industry. Two of the Council members are to be actively involved and certified in structural fumigation.

Pesticide Regulations

In the United States, fumigants are recognized as a specific category of pesticides. The EPA is responsible for evaluating all pesticides, including fumigants, before they can be used. Pesticides that meet EPA's requirements are granted a registration that permits their distribution, sale, and use according to specific use directions on their labeling. The registration process involves scientific, legal, and administrative procedures through which the EPA examines how a product is used and how that use can impact human health and the environment. The EPA regulates pesticides under broad authority granted in the following two major statutes:

- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) - requires all pesticides sold or distributed in the U. S. (including imported pesticides) to be registered by EPA. The EPA can authorize limited use of unregistered pesticides or pesticides registered for other uses to address emergencies and special local needs.
- Federal Food, Drug and Cosmetic Act (FFDCA) - Requires EPA to set pesticide tolerances for all pesticides used in or on food. A tolerance is the maximum permissible level for pesticide residues allowed in or on commodities for human food and animal feed.

Under the Food Quality Protection Act of 1996, which amended both FIFRA and FFDCA, EPA must find that a pesticide poses a "reasonable certainty of no harm" before that pesticide can be registered for use on food or feed.

The Pesticide Labeling

All labeling language must be approved by EPA before a pesticide can be sold or distributed in the U. S. The overall intent of the label is to provide clear directions for effective product performance while minimizing risks to human health and the environment. It is a violation of federal law to use a pesticide in a manner inconsistent with its labeling. The courts consider a label to be a legal document. In addition, following labeling instructions carefully and precisely is necessary to ensure safe and efficacious use.

Each formulated fumigant has a label and a manual. For all fumigants, including structural and commodity fumigants, the manual is part of the labeling. Fumigation employees should have access to the fumigant manual and label when they are preparing a site for fumigation,

introducing the warning agent and fumigant, conducting aeration procedures, and testing for clearance.

Florida State Pesticide Oversight

FDACS registers, performs laboratory analyses, and reviews scientific evaluations of pesticides used in Florida to ensure that adverse effects to human health, animal health, or the environment do not occur. All pesticides distributed or sold in Florida must be registered by FDACS Pesticide Registration Section. Furthermore, because fumigants are restricted-use pesticides they can be purchased and used in Florida only by individuals that hold a State certified operator license in the Fumigation category.

Emergency exemptions from registration are also issued or processed by the FDACS Pesticide Registration Section and submitted to EPA for action. Additionally, Special Registration Actions, such as experimental use permits (EUPs), special local need registrations (SLNs), new active ingredient (NAIs), and significant new use registrations (SNUs) are processed, reviewed, and issued through the FDACS Pesticide Registration Section.

Under Section 24(c) of FIFRA, the State Lead Agency (SLA) can register a new pesticide product for any use, or a federally registered product for an additional use, if there is both a demonstrated "special local need" and a tolerance, exemption from a tolerance, or other clearance under the FFDCA. However, EPA can disapprove a state's proposed special local need registration.

Chapter 2

Target Pests

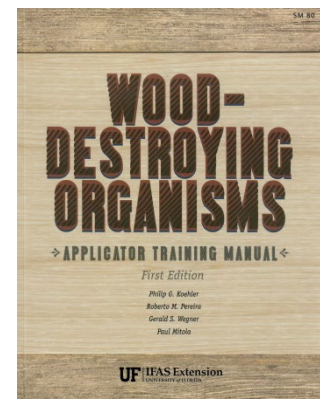
The combined labeling of the fumigants sulfuryl fluoride (SF), methyl bromide, and phosphine enable control a vast array of structural, commodity, and quarantine pests. This chapter will focus on target pests most commonly fumigated in Florida using the residential SF fumigants, Vikane® and Zythor®.

Structural fumigation is a pest control solution that aims at eliminating target pests infesting a structure. However, not all potential pests within a structure can be or should be controlled by structural fumigation and it is essential to first identify the pest organism before any control solution is applied. Drywood termites are by far the most important target pests of structural fumigations in Florida, while wood-boring beetles and aerial infestations (including boats) of subterranean termites account for the other wood-destroying insects controlled by fumigation. However, since the mid-2000s, bed bugs have increasingly been problematic, and fumigation is currently one of the solutions for bed bug eradication within structures. Cockroaches, spiders, rodents, and other miscellaneous household pests are occasional targets of fumigations.

Proper identification of the insect and/or damage is extremely important because this will determine the treatment strategy and, if fumigation is needed, the dosage of fumigant to be used (see Chapter 12. Fumigant Dosage and Dose). In Florida, it is a requirement that the complete common name(s) of the wood-destroying organism(s) and other structural pests to be controlled be listed on the sales contract (commonly called an agreement) [5E-14.105 (e)]. Although bodies of wood-destroying insects are sometimes difficult to collect, other clues to their identity may be found such as wings, damage pattern to wood, mud tubes, and fecal material (pellets or frass), and debris.

- Keep in Mind -

In the context of structural fumigation, this chapter briefly describes the primary target pest insects that commonly infest structures in Florida and the characteristics used to identify them. Additional information and more details on wood destroying organisms found in Florida can be found in the [Wood-Destroying Organisms Applicator Training Manual SM 80](#).



Termites

Termites are soft-bodied insects that live in colonies. Just like ants, they are social insects, with distinct castes, and a complex social organization. Termite colonies have three primary castes: reproductives, workers, and soldiers (Figure 2-1). Because of the many analogies between termites and ants, they are often confused despite distinct characteristics, especially for winged individuals (Figure 2-2A). Winged termites, called alates or "swarmers", are visible during seasonal dispersal flight events to create new colonies (Figure 2-2B). The king and queen are the reproductives. Workers perform all the labor in the colony including caring for the eggs, and feeding and grooming the very young termites (larvae), the reproductives, and the soldiers. Within the termite colony, workers are directly responsible for all the wood damage, as they search for and gather food for the rest of the colony. Soldiers defend the colony against intruders but cannot chew wood, as they are dependent on the workers to feed them.

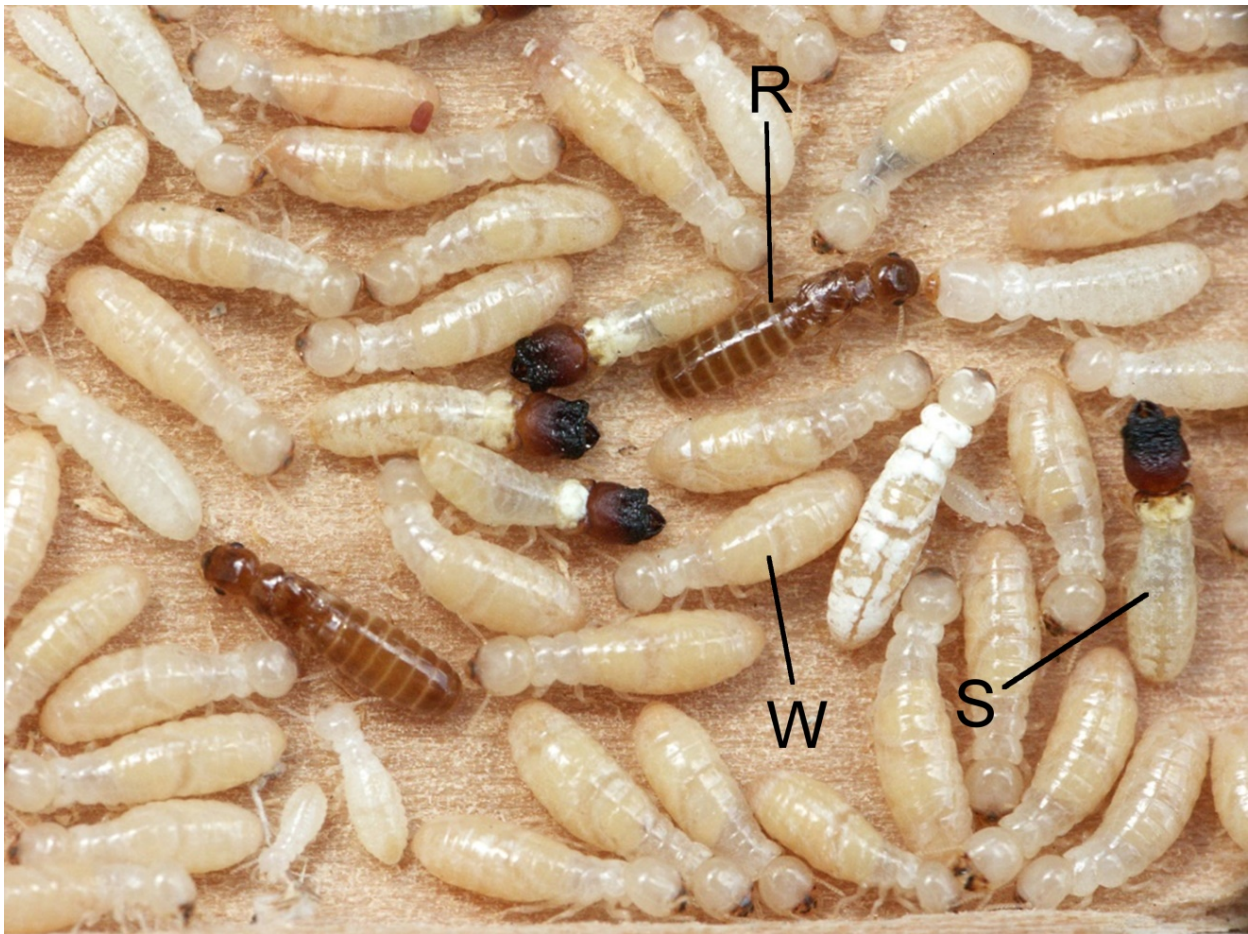
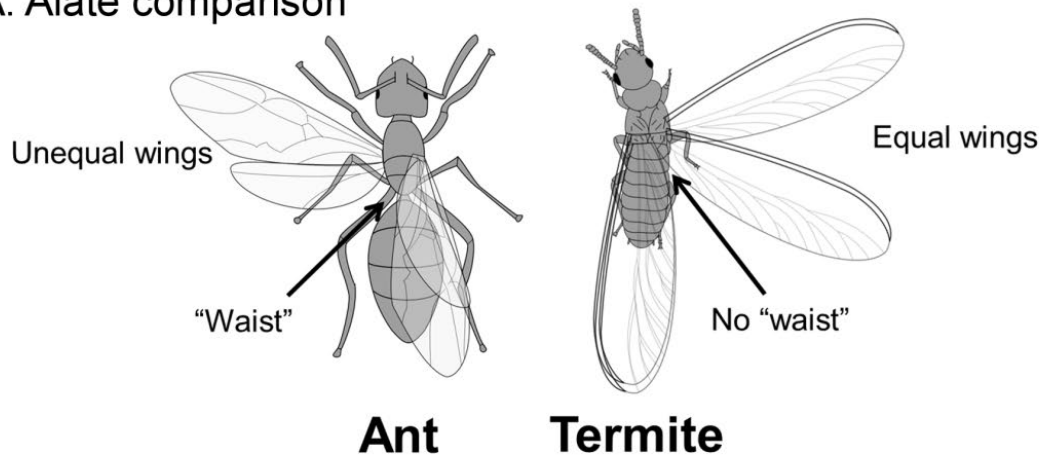


Figure 2-1. Castes of a West Indian drywood termite (*Cryptotermes brevis*) colony. R= reproductive, S = Soldier, W= Worker. (Photo: R. Scheffrahn)

A. Alate comparison



B. A termite life cycle

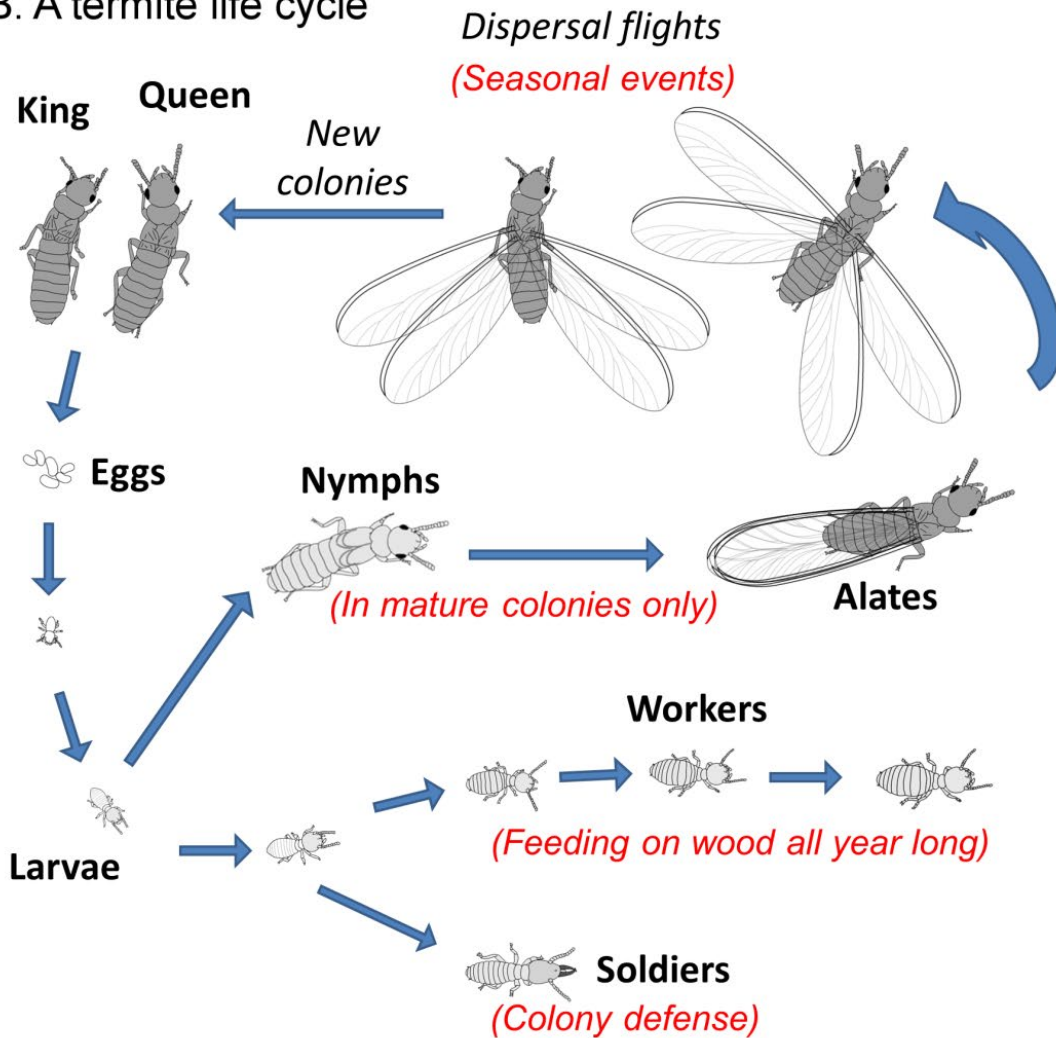


Figure 2-2. A: morphological difference between an ant alate and a termite alate (winged individuals). B: example of a life cycle of in a termite colony (here: *Coptotermes* sp.). It may take up 5-8 years for a colony to reach maturity and produce alates (winged individuals). (Figure: T. Chouvenc)

There are about ~3,000 termite species from 9 different families described in the world, but only 21 species from 3 termite families have been recorded in Florida, and only a handful of these species are considered as major structural pests. All termites in Florida belong to one of following three families:

- Family **Kalotermitidae**: Drywood and Dampwood Termites.
- Family **Rhinotermitidae**: Subterranean Termites.
- Family **Termitidae**: Higher Termites (includes some subterranean and tree-dwelling species).

Although the soldier or alate caste is often used for species identification, the overall morphologies of workers can provide clues if they are Kalotermitidae or Rhinotermitidae, which are the two families with the primary termite pests in Florida (Figure 2-3).

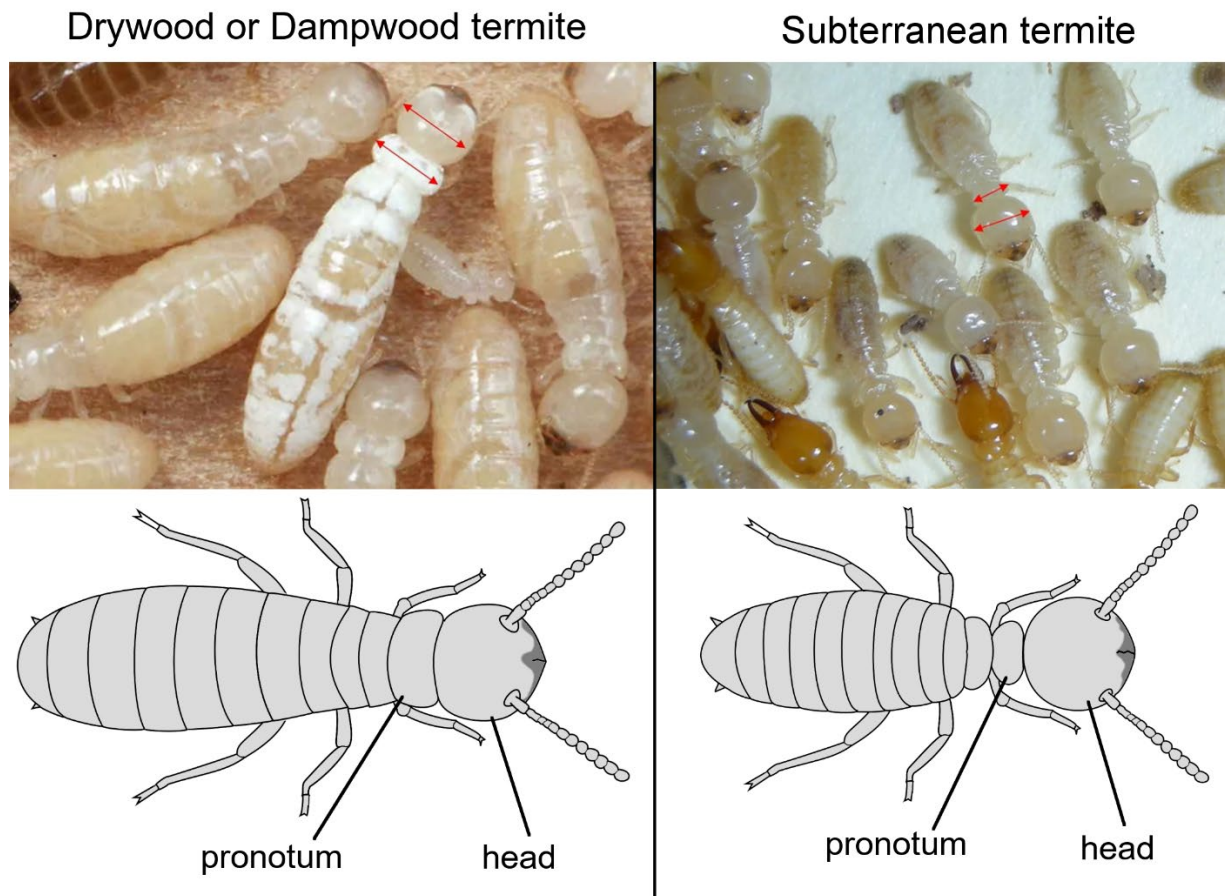


Figure 2-3. Morphology of a termite worker. Workers of Kalotermitidae termites (drywood or dampwood termites) have a general sausage-like morphology, with the pronotum being about as wide as the head. Workers of Rhinotermitidae termites (subterranean termites), have an hourglass-like morphology, and a narrower thorax (see red arrows). (Figure: T. Chouvenc. Photo: R. Scheffrahn)

Drywood and Dampwood Termites (Family Kalotermitidae)

Colonies of Kalotermitidae are restricted to wood; however, only drywood termites usually require a treatment such as fumigation. Wood infested by dampwood termites must be periodically exposed to water. When structural repairs are made to correct wood moisture problems, dampwood termites will no longer have sufficient moisture to survive. On the other hand, drywood termites require no free water to complete their life cycle. Therefore, determining if a structural infestation is from drywood termite or dampwood termite colonies, is critical in making the decision to fumigate or not. [Table 2-1](#) differentiates between the two groups. Comparison of soldier morphology can be seen in [Figure 2-4](#).

Similarities between Dampwood and Drywood termites includes:

- Alate wings have three or more pigmented veins in leading edge of wing.
- Alate wings have diagonal cross veins connecting pigmented veins in outer half.
- Soldiers and workers have the head about as wide as the thorax (Figure 2-3).
- Soldiers have two or more teeth on the inside margin of the mandibles.
- Worker bodies are sausage shaped, only slightly narrowed near thorax.
- Colonies are often restricted to a single piece of wood.
- Galleries meander in wood across growth rings showing little preference to spring or summer growth rings.

Table 2-1. Differences between dampwood and drywood termites.

Drywood Termites	Dampwood Termites
Wood is dry, no evidence of water contact	Wood is damp or shows evidence of periodic water contact, wood rot
Can occur in furniture and interior wood cabinets and fixtures	Never in furniture or fixtures, typically in exterior siding, fascia, or beams
Fecal pellets small and dry, fall freely from opened galleries or "kickout" holes	Fecal pellets larger and sometimes clumped or partially dissolved, do not fall freely from opened galleries or "kickout" holes
Workers, soldiers, & alates intermediate in size <¼"	Workers, soldiers, & alates large ~ ½"
Soldiers of <i>Cryptotermes</i> have black plug-like heads and short mandibles. Soldiers of <i>Incisitermes</i> have projecting mandibles, enlarged 3 rd antennal segments, and a broad V-shaped front margin of the prothorax	Large soldiers always with orange heads and projecting mandibles
Alates with 3 pigmented veins in leading edge of wing near point of attachment to body	Alates with 4 or more pigmented veins in leading edge of wing near point of attachment to body

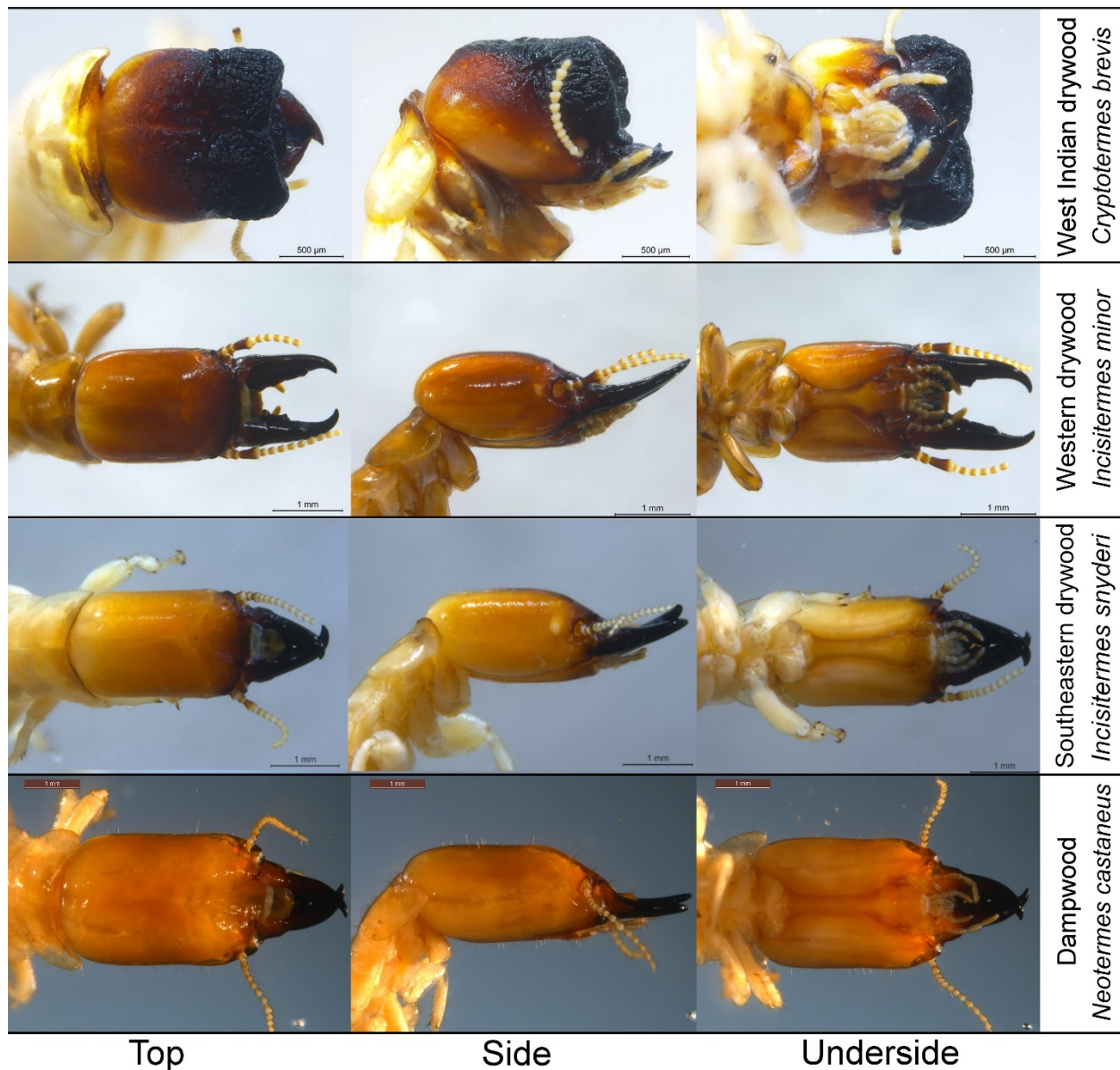


Figure 2-4. Comparison of some Kalotermitidae soldier morphology. (Photos: R. Scheffrahn)

Drywood Termites

Drywood termites live in non-decayed, dry wood (Figure 2-5A) and do not need a connection with the ground. Drywood termites eat both the softer spring and denser summer growth rings often leaving the infested wood riddled throughout with galleries (Figure 2-5B). Drywood termite galleries connect to small “kickout” holes (1/16th”) on the wood surface from which they eject fecal pellets or from which alates emerge (Figure 2-5C, 2-5H). When not in use, kickout holes are sealed. The presence of wings gives a clue that a recent termite dispersal flight took place in the area (Figure 2-5D, 2-5I). Often, the most obvious signs of drywood termite infestation are piles or scatterings of frass on floors, windowsills, and other surfaces (Figure 2-5E). The frass feels dry and gritty when rolled between the fingers. Viewed under a microscope, the pellets are

hexagonal in cross section with a blunt and a more pointed end (Figure 2-5F) that range in color from cream to black (Figure 2-5G). There is no other wood infesting insect that has frass shaped like drywood termite pellets. Three primary species can be structural pests (Table 2-2): the West Indian drywood termite (*Cryptotermes brevis*), Southeastern drywood termites (*Incisitermes snyderi*) and western drywood termite (*Incisitermes minor*). All species have been found statewide, however drywood termites are far more common in the more tropical southern portions of Florida. All three species have alates with body lengths less than ½”.

Table 2-2. Differences between three drywood termite species in Florida.

	West Indian Drywood (<i>C. brevis</i>)	Southeastern Drywood (<i>I. snyderi</i>)	Western Drywood (<i>I. minor</i>)
Occurrence	Most common	Casual	Rare, restricted locations
Wood infestations	Framing, doors, furniture plywood, cabinetry, pallets, shelves, frames, household items	Exterior wood only if in structures (most commonly found in dead tree branches)	Indoor wood only, furniture in Florida only
Alate size and body color	Brown on top, creamy underside. (Figure 2-6A)	Yellow-brown to pale reddish-brown	Reddish-brown head and dark-brown abdomen
Wing color	Iridescent transparent (Figure 2-6C)	Transparent	Smoky dark, iridescent (Figure 2-6E)
Dark veins on leading edge	3 (Figure 2-6B)	3	3
Swarming season peak	April-June at sunset or sunrise	May-August at dusk-night	September-November daytime flights
Soldier	¼” body length, plug-like head (phragmotic) (Figure 2-6D)	5/16” body length, dark yellow head, forward mandible with teeth	Enlarged 3 rd antennal segment (Figure 2-4)

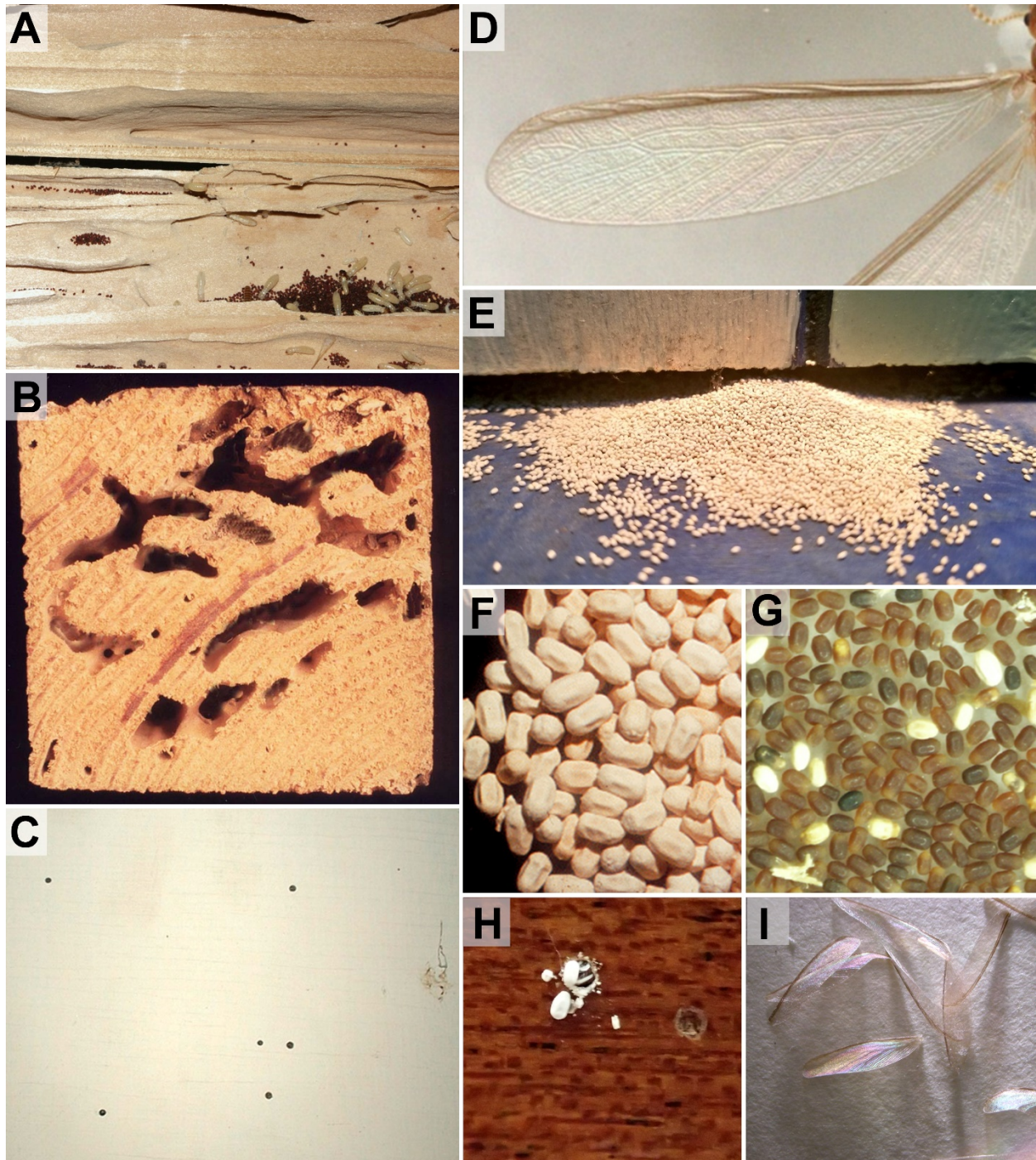


Figure 2-5. A: wood infested by *Cryptotermes brevis* split open to show clean-walled gallery structure, termites, and dry fecal pellets. B: cross-section of drywood termite-infested wood showing galleries cutting across the wood grain. C: drywood termite kickout holes on a painted wood surface. D: *Cryptotermes brevis* wing showing iridescent color from reflected light. E: accumulation of drywood termite fecal pellet below a kickout hole. Often, the further the spread of the pile, the higher the kickout hole. F: drywood termite fecal pellets are six-sided in cross section. G: drywood termite fecal pellets vary in color. H: fecal pellet being kicked out by a worker from a kickout hole. I: *Cryptotermes brevis* wings accumulating after a dispersal flight. (Photos: R. Scheffrahn, T. Chouvenc)

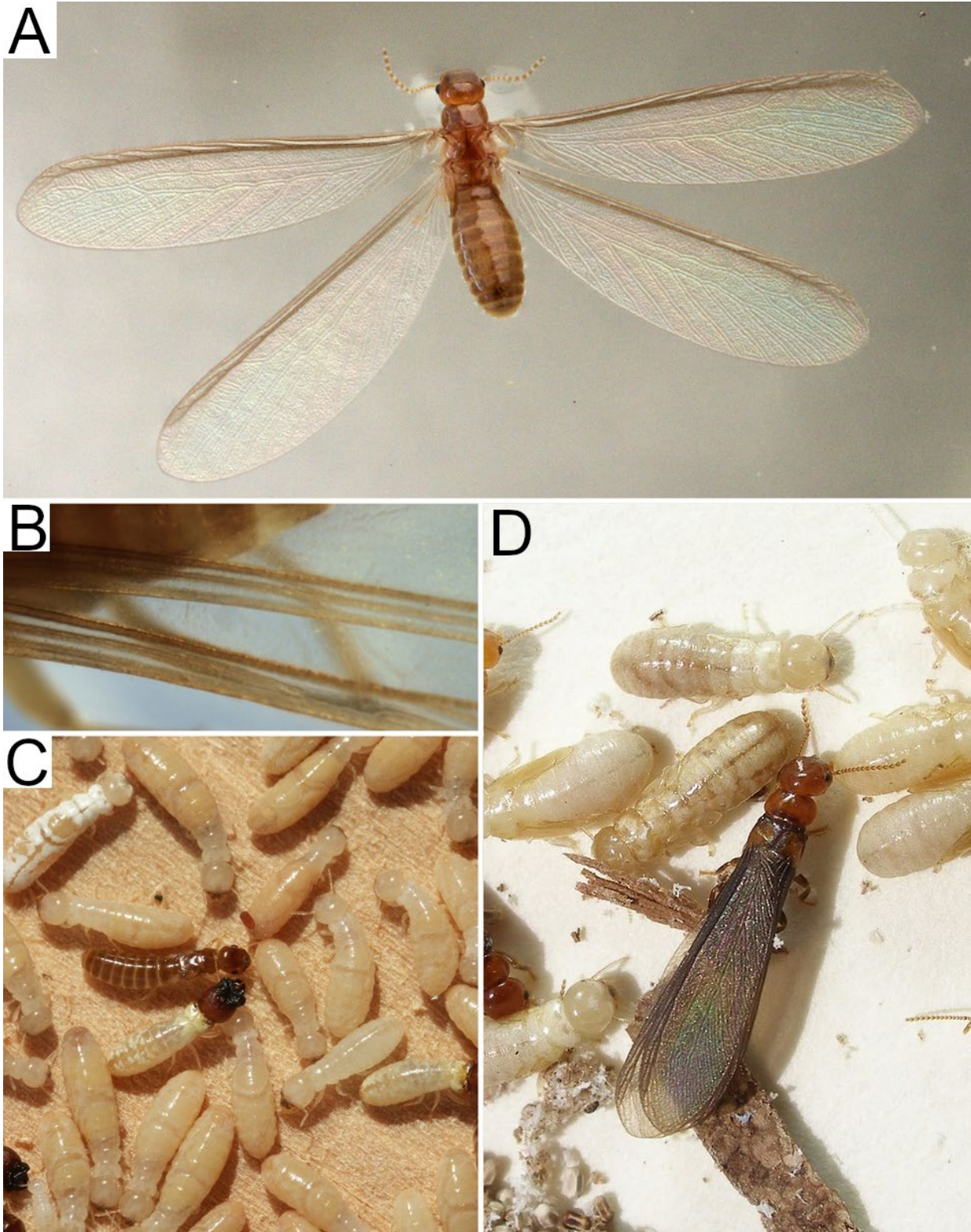


Figure 2-6. A: drywood termite (*Cryptotermes brevis*) alate floating on water. B: three pigmented veins on drywood termite wing. C: drywood termite colony. E: Western drywood termite (*Incisitermes minor*) alate and workers. (Photos: R. Scheffrahn)

Dampwood Termites

Dampwood termites live in branches, logs, stumps, dead trees, and sometimes, structural wood exposed to water. They also infest live trees, constructing galleries in the trunks and large branches. Dampwood termite galleries are often filled with clumped fecal pellets that sometimes dissolve into a mud-like paste. Structural infestations by dampwood termites occur in wood in contact with water or moist soil, or wood that is exposed to by water from leaky pipes, sprinklers, leaks in roofs, extending beyond the roof line, etc. They cannot survive without a source of moisture. Often, colonies are contained within a single piece of wood, and can be remedied by eliminating their water source and replacing the damaged wood. Three species of Florida dampwood termites in the genus *Neotermes* are known. Termites from the *Neotermes* genus are the largest termites, compared to another termite species in the state of Florida. Alates of *Neotermes* are about 5/8" long (wings 7/16" long (Figure 2-7A). Soldiers are about 7/16" long while workers average 5/16" in length. (Figure 2-4). Alates are also larger than any other termite species in Florida, and can be identified by their wing venation, with at least four pigmented veins on the leading edge (Figure 2-7B).

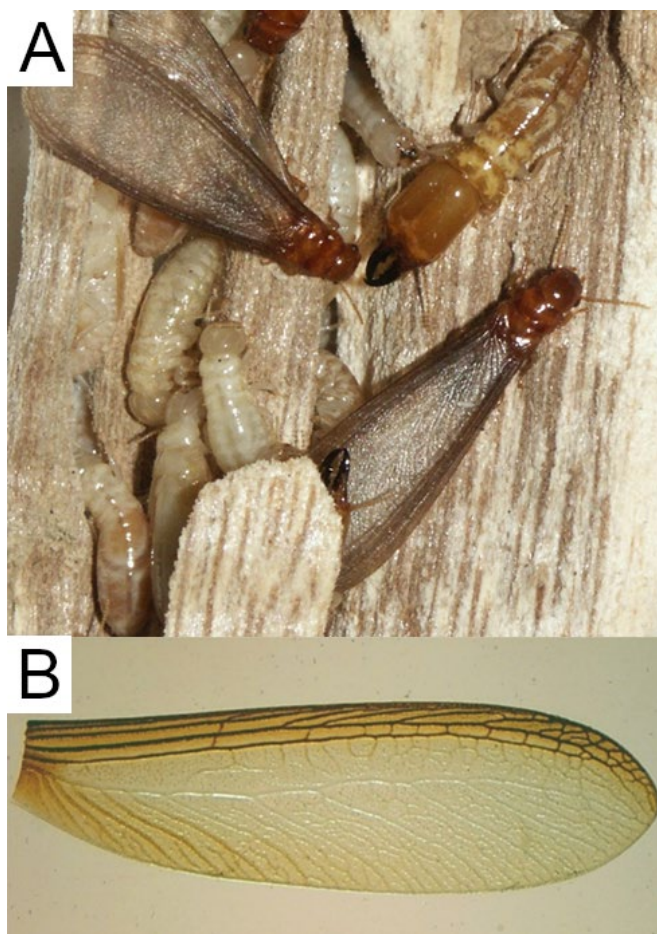


Figure 2-7. A: dampwood (*Neotermes castaneus*) termite colony. B: four or more pigmented veins on dampwood termite wing. (Photos: R. Scheffrahn)

Subterranean Termites (Family Rhinotermitidae)

Subterranean termites are in the termite family Rhinotermitidae and differ from Kalotermitidae in many ways (Table 2-3). Subterranean termites nest underground or in trees, build a network of tunnels in the ground that, in some species, can extend hundreds of feet, connecting foraging sites. Besides wood, the main requirement for subterranean termite survival is moisture. Water from leaks, air conditioners, or poorly placed sprinklers, and poor drainage from roofs and gutters can keep colonies thriving inside structures without a need for contact with the ground. Occasionally, subterranean termites, especially *Coptotermes*, may colonize boats, or upper portions of buildings without ground contact (aerial infestations). However, true aerial infestations are often difficult to fully confirm owing to the potential presence of galleries leading to the ground, not visible during inspection. Only for the case of aerial infestations and boats is fumigation an effective treatment option for subterranean termites. In any other circumstances, alternative treatments specific to subterranean termites should be sought. Subterranean termites prefer eating the less dense spring growth rings (visible as the lighter colored wood in the growth ring) rather than the harder, denser summer rings. (Figure 2-8). Subterranean termites may cover damaged wood with soil and their feces. They also make carton, a sponge-like material made from their feces that dries and hardens to form a protective barrier and increases the surface to volume ratio within the nest.

Table 2-3. Differences between drywood and dampwood termites and subterranean termites.

Drywood and Dampwood Termites	Subterranean Termites
Alate wings have three or more pigmented veins on leading edge of wing	Alate wings have two pigmented veins on leading edge of wing
Alate wings have diagonal cross veins connecting pigmented veins in outer (distal) half	Alate wings have no diagonal cross veins connecting pigmented veins in outer(distal) half
Soldiers and workers have head about as wide as pronotum	Soldiers and workers have head wider than pronotum
Soldiers have two or more teeth on the inside margin of the mandibles	Soldiers have no teeth, smooth inside margin of the mandibles
Worker bodies are sausage-shaped, only slightly narrowed at thorax	Worker bodies are more hourglass shaped than sausage shaped because of the narrow thorax
Fecal pellets are six sided in cross section when fresh or freshly dried	Feces are liquid and dry as spots used to line foraging tubes. Cannot survive without access to water
Colonies are restricted to a single piece of wood or multiple pieces if joined by fasteners when used in construction	Colonies forage considerable distances between food sources via underground galleries and above-ground foraging tubes
Galleries in wood meander across growth rings showing little food preference to spring or summer growth	Galleries in wood begin in softer spring growth rings before summer rings are eaten
Nest in wood above ground	Central nest at remote locations, sometimes in trees, connected through underground galleries, or above ground using mud tubes. Aerial nests are possible if the colony has reliable access to water, such as roofs or boats.



Figure 2-8. Examples of structural timber damaged by subterranean termites. The spring wood is often attacked first, and damage usually follows the grain of the wood (Photos: R. Scheffrahn, T. Chouvenec)

Subterranean termites foraging above ground build tubes made from soil and feces. These covered trails (shelter tubes, or mud) provide protection and often appear on walls (Figure 2-9A, 2-9B). They are easily broken by hand and termites may be found inside. Carton nests can be found within wall voids and in trees (Figure 2-9C, 2-9D, 9-2E). If a dispersal flight takes place inside a structure, a large number (sometimes thousands) of wings and/or alate bodies can be found, (Figure 2-10). Native subterranean termites in the genus *Reticulitermes* occurring throughout Florida are primary pest species, including the eastern subterranean termite, *Reticulitermes flavipes*, and the dark southern subterranean termite, *Reticulitermes virginicus*. Both species have alates with black bodies and their soldiers display a characteristic rectangular head shape (Figure 2-9). Two non-native species of subterranean termites are major structural pests in Florida. The Formosan subterranean termite, *Coptotermes formosanus* is a subtropical termite species found in localized areas throughout much of the State of Florida. A related species with a tropical distribution, the Asian subterranean termite *Copototermes gestroi* only occurs in the US from West Palm Beach to Key West. The alates of both *Coptotermes* species (Figure 2-10A) have wings that are covered with hair (Figure 2-10B), and soldiers of both species display a characteristic tear-drop shape head (Figure 2-10C), with the ability to exude a white secretion from their head.

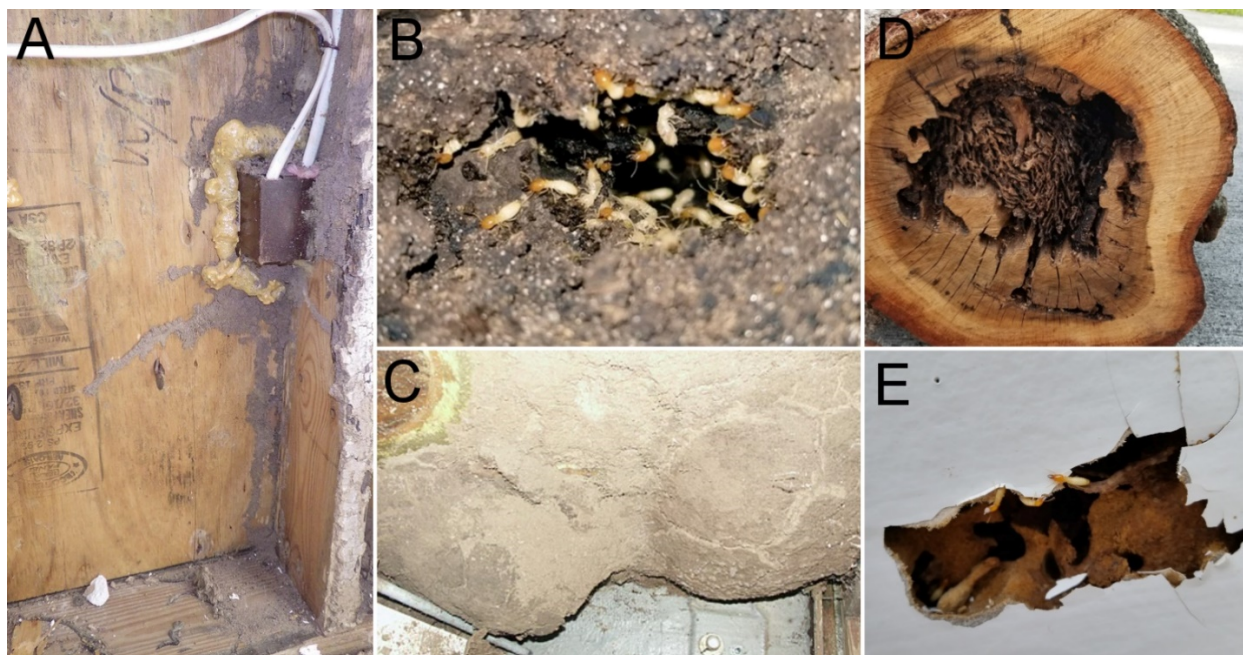


Figure 2-9. Signs of subterranean termite activity (*Coptotermes*): A: foraging tubes on a wall. B: when a mud tube is broken, termite soldiers come out. C: carton nest within in a can be found in attics, walls and in boats. D: carton nest inside a tree. E: termite activity within a drywall. (Photos: T. Chouvenc, R. Scheffrahn, M. Wilson)

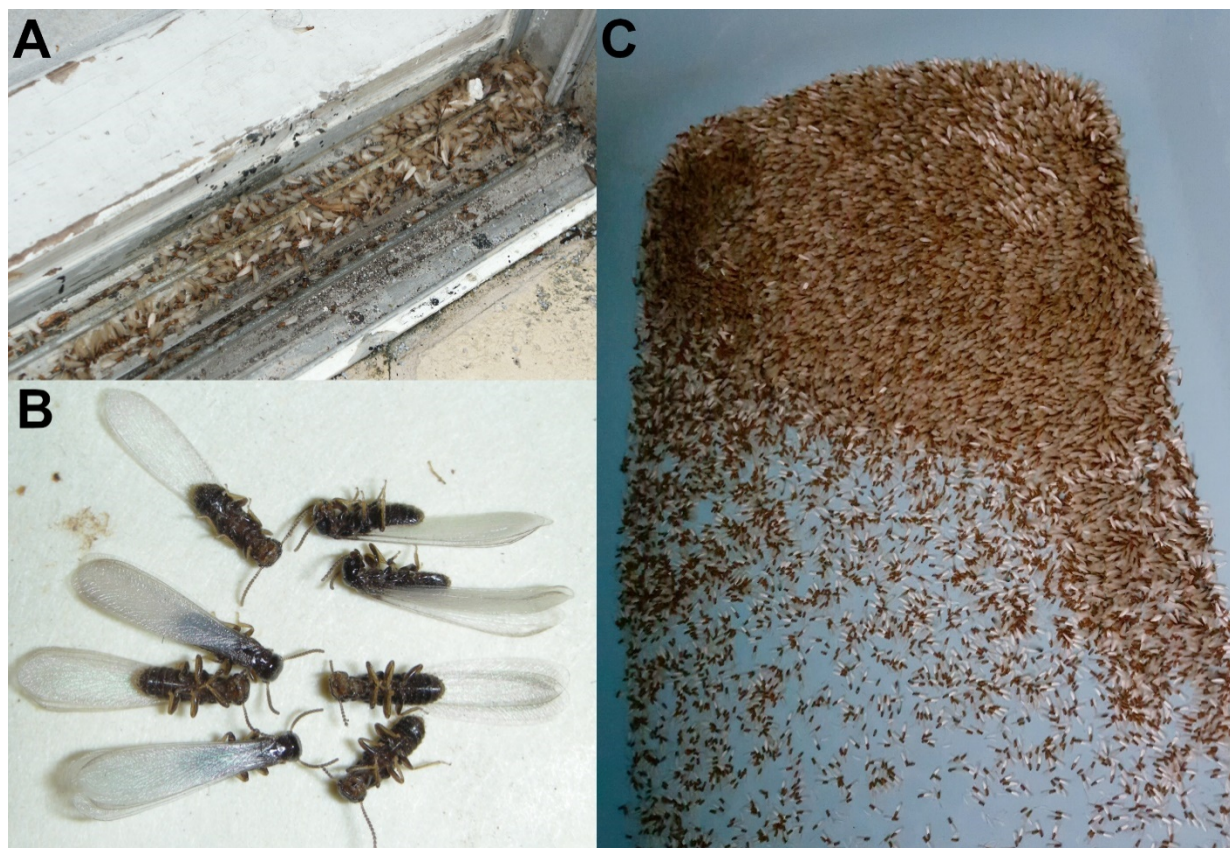


Figure 2-10. Accumulation of alates within structures after a dispersal flight event, A: by a sliding door (*Coptotermes*), B: by a window (*Reticulitermes*), or C: in a bath tub (*Coptotermes*). (Photos: R. Scheffrahn)



Figure 2-11. The dark southern subterranean termite, *Reticulitermes virginicus*. Soldier head shape is rectangular, and alates have a black body and wings display net-like reticulation appearance. (Photos: R. Scheffrahn)

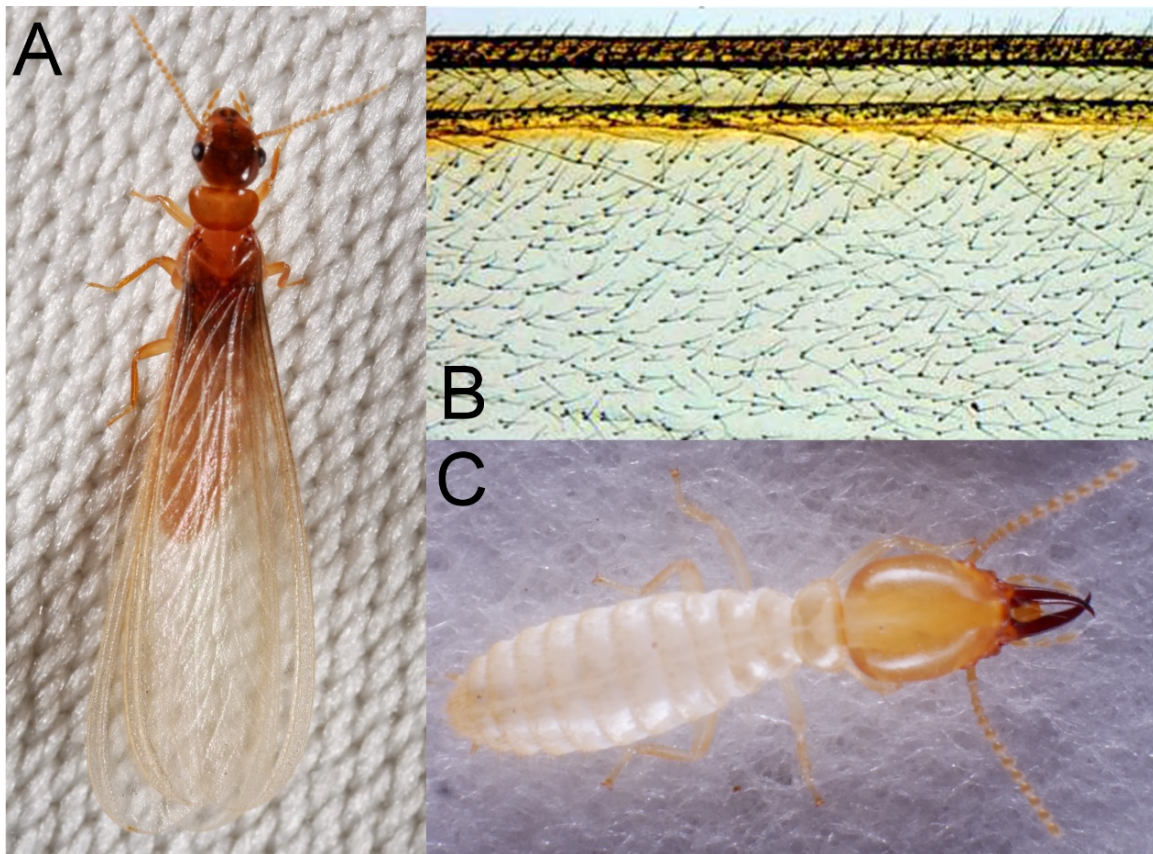


Figure 2-12. Invasive subterranean termites from the genus *Coptotermes*. A: *Coptotermes formosanus* alate (Formosan subterranean termite). B: Close up on wings with two sclerotized veins and covered with hair (*Coptotermes*). C: Soldier with tear-drop head shape in *Coptotermes* (here, the Asian subterranean termite). (Photos: T. Chouvenc, R. Scheffrahn)

Three other subterranean termite species with a minor pest status, *Reticulitermes hageni*, *Heterotermes cardini* (Figure 2-13A) and *Prorhinotermes simplex* (Figure 2-13B), are not further discussed here.

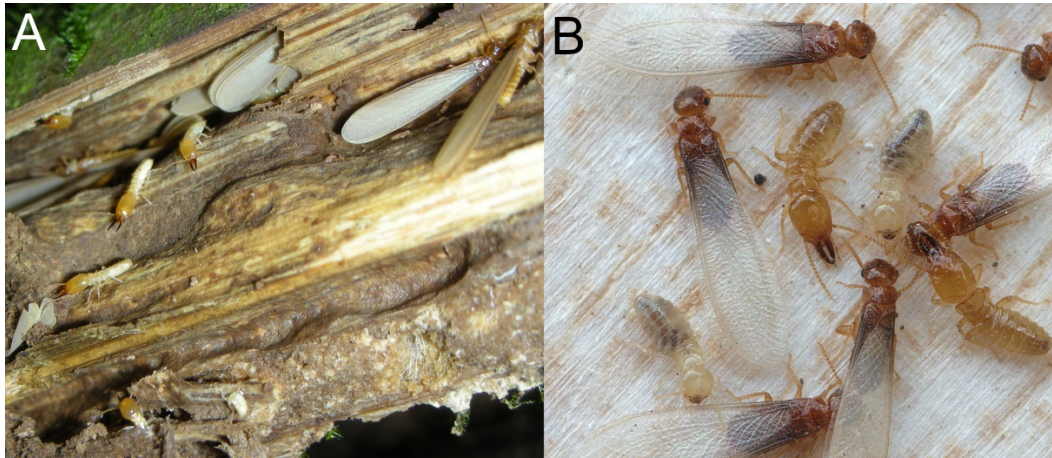


Figure 2-13. Other subterranean termites. A: *Heterotermes cardini*. B: *Prorhinotermes simplex*. (Photos: R. Scheffrahn)

Higher Termites (Family Termitidae)

One species, *Amitermes floridensis*, the Florida dark winged subterranean termite, is native to central Florida and is mostly a nuisance pest due to large dispersal flights after rain. This species occasionally builds foraging tubes on structures but usually limits attack to wood in contact with soil. The only other higher termite found in Florida, *Nasutitermes corniger*, or “conehead termite” (Figure 2-14), was discovered in 2001 in Broward County and is the subject of an eradication effort begun in 2003. The two known established populations in Dania Beach and Pompano Beach are still under monitoring after a large eradication campaign. Any infestation, if discovered, must immediately be reported to [the Florida Department of Agriculture and Consumer Services](#) (FDACS). It is therefore imperative for all pest control operators to know how to identify such species, to speed up the detection and reporting effort.

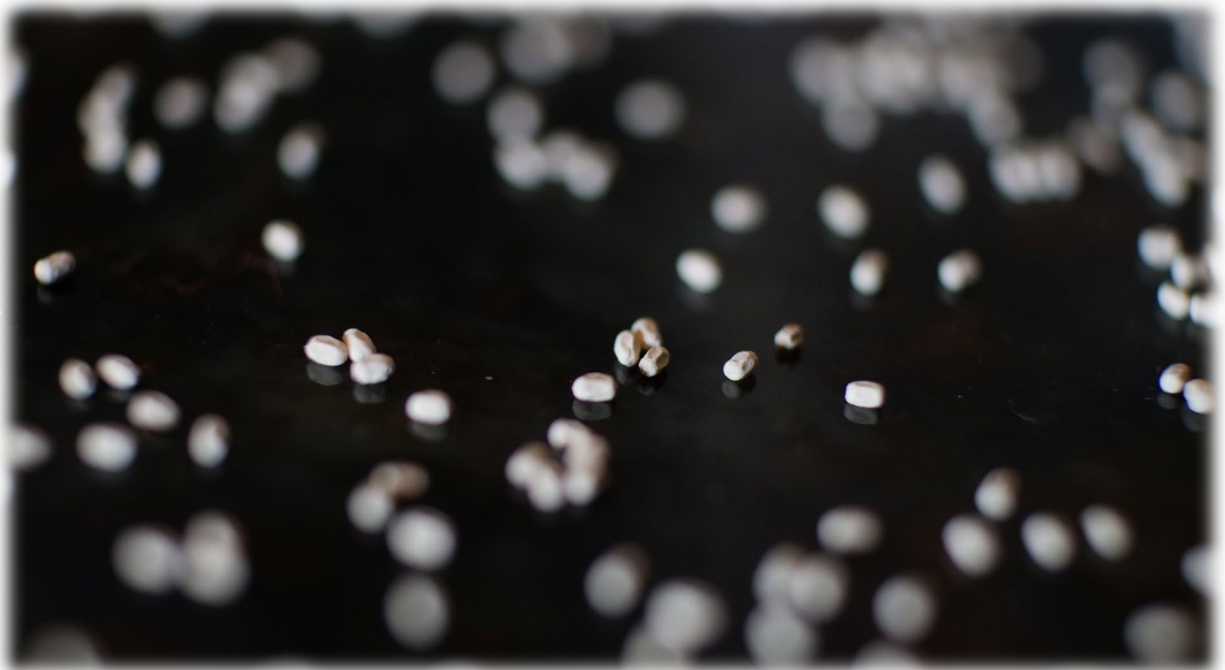


Figure 2-14. A: *Nasutitermes corniger* soldier (Conehead termite). B: Aerial nest in trees. (Photo: T. Chouvenc)

Fumigating Termites

Because termites are social insects, the death of all workers effectively results in colony elimination. Soldiers, primary reproductive, and larvae are not able to survive and feed on their own. Similarly, eggs cannot survive and hatch without the help of workers. Therefore, during a structural fumigation for drywood termites, the sulfuryl fluoride dosage on the labeling (1X for drywood termites) is aimed at killing the workers. It is possible that termite eggs may survive the fumigation, but they ultimately die because of lack of care. See Chapter 12, Fumigant Dosage and Dose, for additional information.

Fumigation for subterranean termites should only be performed against confirmed aerial colonies, where no contact to the ground exists, or in boats. Fumigating a structure with subterranean termites in full contact to the ground only kills the termites in the structure at the time of the fumigation, but the rest of the colony that was not directly exposed impacted, can move back into the structure, and may resume feeding immediately after fumigation.



Beetles

Drywood termites are the primary reason for structural fumigation in Florida; however, wood-destroying beetles remain a significant reason for structural fumigations in Florida. The immature stage, or larva, accounts for the feeding damage that usually is noticed after the adult beetle chews itself out of the infested wood.

True Powderpost Beetles – “Lyctids” (Bostrichidae: Lyctinae)

The name “powderpost beetle” is often given to any small wood-infesting beetle. However, in the strictest sense there is only one group of true powderpost beetles. Adults have an elongate, flattened body, small size from 1/16” to 5/16” long, head visible when beetle is viewed from above, and the last two segments of the antennae are enlarged forming a “club” (Figure 2-15A, 2-15B). True powderpost beetle frass is very fine like flour or talcum powder and does not contain any pellets or bits of wood. Larvae cause the damage as they feed inside the wood and the adults make round exit holes 1/32” to 1/8” when they bore out of the wood (Figure 2-15C, 2-15D). True powderpost beetles will re-infest the same or nearby pieces of wood. Powderpost beetles infest hardwoods (such as oak, maple, ash, walnut, alder, cherry, beech, and mahogany). These woods are often used in furniture, cabinetry, flooring, paneling, trim, picture frames, sculptures, tool handles, and decorative objects. Powderpost beetles also infest bamboo. These woods have small pores that the beetles lay their eggs in. True powderpost beetles do not infest softwoods (such as pine, spruce, and fir) because they lack such pores.

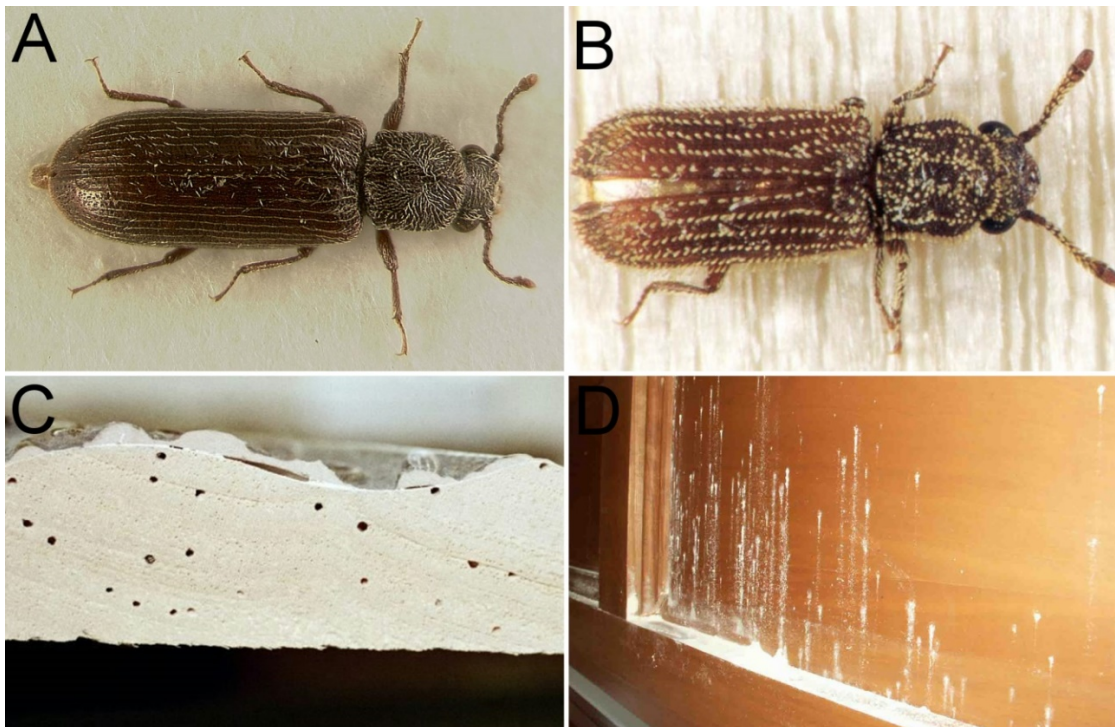


Figure 2-12. True powderpost beetles. A: *Lyctus* sp. B: *Minthea* sp. Note the club-shaped two last antennal segments. C: true powderpost beetle exit holes. D: true powderpost beetle frass. (Photos: B. Cabrera)

Deathwatch Beetles – “Anobiid” (Ptinidae: Xyletininae, Anobiinae)

Anobiid beetles are brown, dark brown to red-brown. Adult body shapes vary from long and thin to oval or stout, ranging from about 1/32” to 5/16” in length. The head is often hidden by the hood-shaped pronotum when viewed from above (Figure 2-16A, 2-16B). Antennae have different forms, but the last three segments are usually enlarged or if not, the antennal segments are saw-toothed or antler-like. When feeding on softwoods, anobiid beetle frass consists of small, dry, lemon-, or bun-shaped fecal pellets (Figure 2-16C) without indentations. The frass is often loosely packed inside the wood. Small bits of chewed wood may also be mixed in with it. In hardwoods, the frass is more powdery, has less pellets, and is more tightly packed. Anobiid beetles make round exit holes (Figure 2-16D) between 1/32” to 1/8” in diameter and will re-infest wood. Anobiids attack both soft- and hardwoods. They prefer wood with moisture content between 12 to 30%. Anobiid infestations tend to occur in damp places such as sub-floor and crawlspace areas with poor ventilation.



Figure 2-16. Anobiid beetle (*Euvrilletta peltata*) showing heads hidden underneath a hooded pronotum) A: dorsal view. B: lateral view. C: anobiid beetle frass. Note the lack of indentations compared with drywood termite pellets. D: anobiid beetle emergence holes. (Photos: B. Cabrera)

- Keep in Mind -

Deathwatch beetles are sometimes misidentified with other “anobiids” that are not wood destroying organisms, such as the Mexican book beetle, the drugstore beetle or the cigarette beetle. Wood damage should therefore first be confirmed.

False Powderpost Beetles – “Bostrichids” (Bostrichidae: Bostrichinae)

False powderpost beetles own their name because their damage is similar to that of the true powderpost beetles (see above). Adult false powderpost beetles are dark brown to black beetles and can range from 1/8” to 1/2” in length. The head is often hidden by the pronotum when the beetle is viewed from above, with a cylindrical or stout body and short antennae with last 3 or 4 segments saw-tooth shaped and enlarged forming a club. False powderpost beetle frass contains small bits of wood, a few pellets, and fine powder. It feels gritty and tends to clump together. Adults make round exit holes as they emerge from wood. False powderpost beetles attack both soft- and hardwoods but they prefer the latter. They infest wood that has no less than 10% wood moisture content and generally like newer versus aged wood. Unlike true powderpost beetles and anobiids, false powderpost beetles do not usually re-infest the same piece of wood after it has become dry and seasoned. In Florida, the bamboo borer (Figure 2-17A, 2-17B) is a small species commonly found in bamboo but will also infest dried foods, seeds, and roots. The oriental wood borer (Figure 2-17C) is a larger species that attacks lumber and is also known to infest oak trees in Florida.

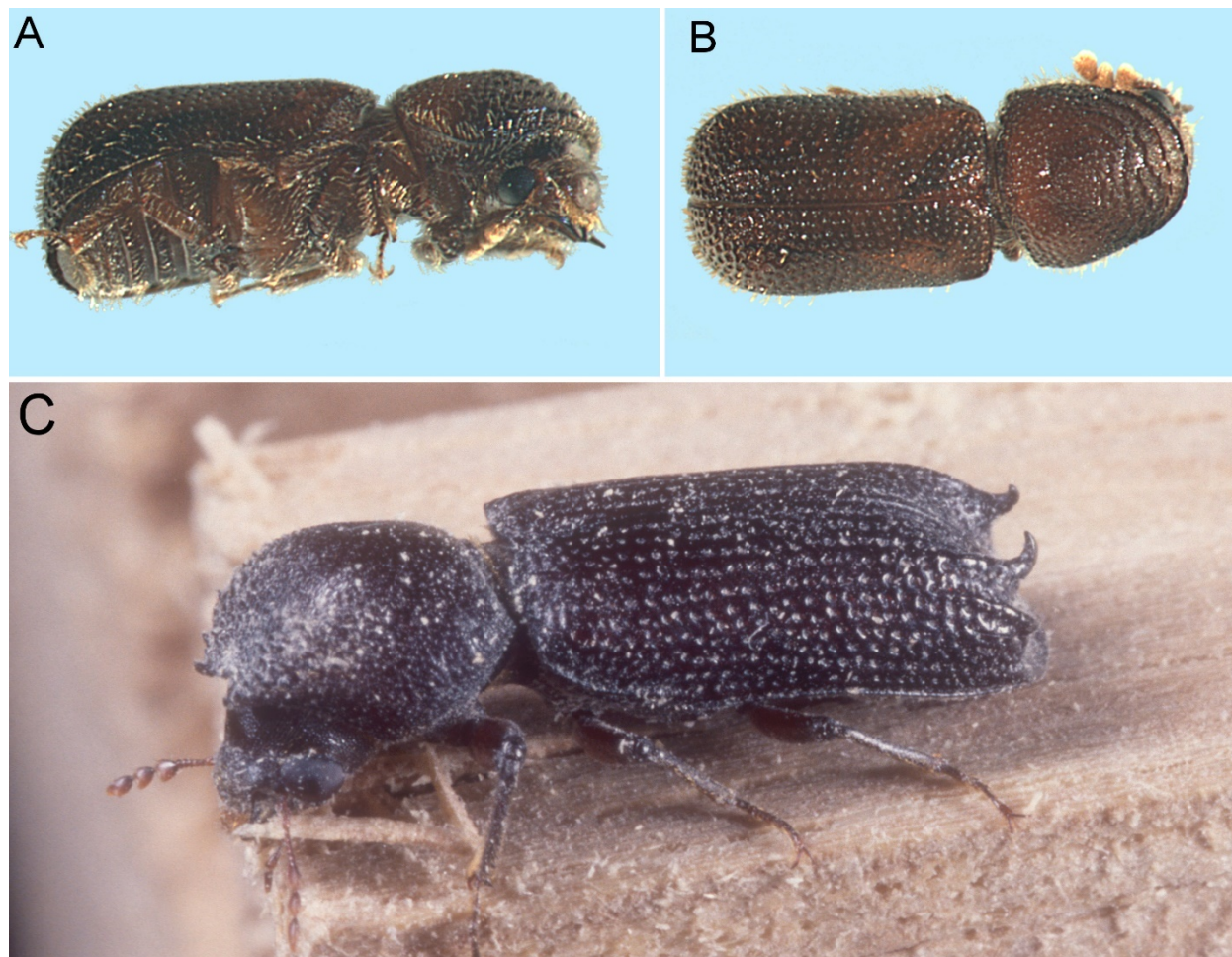


Figure 2-17. False powderpost beetles. A and B: the bamboo borer (*Dinoderus minutus*). C: the Oriental wood borer (*Heterobostrychus aequalis*). (Photos: B. Cabrera, L. Buss)

Old House Borer – a Longhorn Beetle (Cerambycidae)

The old house borer, *Hylotrupes bajulus*, is one of the largest wood-infesting beetles found in structures and is a common pest in many parts of the southeastern U.S. Long-horned beetle larvae are known as “round-headed borers” because larvae and emergence holes are round or oval, but not as flattened as those of “flat-headed borers” (Buprestidae). Late stage old house borer larvae are actually larger than the adults and grow to between 3/4” to 1.5” long. Adults are dark gray to brown-black beetles with light-colored hairs on the head and thorax (Figure 2-18A). The body is elongated, a bit flattened, and from 5/8” to 1” long. Their antennae are about half as long as the body, and there are two shiny, round bumps without hair on the prothorax, looking like black spots. Old house borer frass is a mixture of fine powder and pellets tightly packed into the tunnels. Large amounts of frass may collect on surfaces below the exit holes. The larvae can inflict tremendous damage as they feed and burrow through a piece of wood. Sometimes they will consume most of the inner wood leaving only a thin outer shell. Beetles emerging from wood make oval exit holes measuring 1/4” to 3/8” across (Figure 2-18B). Old house borers infest softwoods such as pine, fir, and spruce and prefer wood that is 10 years old or less. Eggs may be laid in wood stored in lumberyards; thus infested wood can be built into a structure. Rafters, attic and floor joists, and studs are commonly infested.



Figure 2-18. A: old house borer, *Hylotrupes bajulus*, adult. B: old house borer exit hole. (Photos: B. Cabrera)

Other Beetles

Phoenicobiella chamaeropsis, the “chickee hut” beetle larvae can be found in the petiole of dry palm fronds of chickee and tiki hut roofs. The frass produced by the larvae often disturb people sitting under the hut, as the fine dust falls on them or their meal/drink. Such structures can be fumigated to eliminate all stages of the life cycle of this beetle species.

Many other small to medium-sized beetles can sometimes be found in structures, but if they don't match any of the above-mentioned beetle, they may be casual intrusions from outside with no wood destroying ability within the structure and may not have the need for control measures. For example, many ambrosia beetles and bark beetles can infest trees and enter structures in firewood, but do not infest structures. In addition, flat-headed borers (Buprestidae), and except

for old house borers, all other round-headed borers (Cerambycidae), may emerge from structural or furniture lumber, but do not reinfest seasoned wood and do not require fumigation. Confirming beetle identification (Table 2-4) is therefore important before recommending for structural fumigation.

Table 2-4. Overview of primary wood destroying beetles.

Traits	True Powderpost Beetles	Deathwatch Beetles	False Powderpost Beetles	Old House Borer
Preferred wood	Sapwood of wide pored hardwoods, like oak, ash, mahogany, and hickory. Bamboo. Require a high (>3%) starch content, so new wood. Prefer wood with 8-30% moisture.	Either hardwoods (like yellow poplar) or softwoods (like southern yellow pine). More commonly reported in softwoods because structural lumber is less likely to be painted.	Sapwood of hardwoods. Usually just new wood (a few years old). The bamboo borer attacks bamboo.	Only pine, spruce, and other softwoods. They are usually built into the structure. A common problem in log homes.
Exit Holes	Round, from 1/32" to 1/8"	Round, from 1/16" to 1/8"	Round, 3/32" to 9/32"	Oval, 1/4" to 3/8"
Frass	Extremely fine powder that is not at all gritty in texture.	Fine to coarse, pellet or bun shaped with gritty texture. Often loose in tunnels but does not easily fall through exit holes.	Powdery, but with a slightly gritty texture, similar to corn flour.	Sawdust like frass is densely packed into the tunnels.
Larvae	Large spiracle on the 8th abdominal segment.	Grub-like with an enlarged terminal segment.	Tiny white grub. No enlarged terminal segment and no enlarged spiracle and on the 8 th abdominal segment.	Large larvae with round head and constrictions between segments.

Fumigating Wood Destroying Beetles

Contrary to termites, old house borers and other wood destroying beetle eggs and larvae do not need the care of adults to survive. Therefore, it is critical that all life stages of the insects are killed during fumigation to obtain eradication of the target pest within the structure. Because of this requirement, the sulfuryl fluoride dosage used during fumigation must reach a value that can kill beetle eggs (10X) and old house borer eggs (4X), which is the less susceptible life stage to fumigants (See details in Chapter 12, Dosage and Dose). Because of the high dosage of fumigant required for wood destroying beetles and old house borers, solutions to reduce the volume to fumigate (compartmentalization approaches) can result in a substantial reduction of the amount of gas necessary to reach target elimination (See example in Chapter 10, Sealing).

Bed Bugs

Since the mid-2000s, bed bugs have become a resurgent problem as a pest with public health concerns. Although not wood destroying organisms, they can be listed as potential target pests for structural fumigation. Their cryptic lifestyle also renders the use of modern pesticides challenging, as some life stages may not be directly accessible to topical sprays. This has resulted in an increase of the use of fumigation for some structural infestations. Bed bugs are blood-sucking insects that can establish large populations in households if unchecked. Although bed bugs are not known to transmit disease, the presence of bed bugs can induce various level of distress and allergies in residents exposed to such infestation.

Bed bugs are blood-feeding true bugs in the family (Cimicidae) with a typical flattened oval shape, brown-red in color. Bed bugs life cycle include the egg, five instar larvae stages and the adult (**Figure 2-19**). During a structural fumigation, all life cycle stages must be killed, because as with wood destroying beetles, eggs can hatch on their own and nymph can feed on their own. Depending on the labeling of the sulfuryl fluoride product used, dosage for bed bugs is currently 1.9X or 3X.



Figure 2-19. Adult bed bug. Adult size = 1/4". (Photo: T. Chouvenc)

Other Non-Wood Destroying Structural Pests

Although most structural fumigations in the United States are for wood-destroying insects, structural infestations of other pests may arise where fumigation is needed. Examples of such cases are large or severe infestations, infestations in difficult to treat locations, and when standard methods of non-fumigant control are not working. Among such insect pests are cockroaches, carpet beetles, stored-product beetles and moths, clothes moths, bed bugs, and spiders. Rodents such as rats and mice are typically the only vertebrate pests for which fumigation may be prescribed (Figure 2-20). The primary list of target pests for fumigation can be found in Table 2-5.



Figure 2-20. Case of extreme rat infestation in a dead *Ficus* tree, where fumigation was used to prevent rat dispersal before cutting the tree down. (Photos: R. Scheffrahn)

Table 2-5. Summary of for target pest that require structural fumigation and those that do not.

Fumigation Target Pests	Non-fumigation Target Pests
<u>Termites, ants, and bees</u>	
<ul style="list-style-type: none"> • Drywood termites (Kalotermitidae) • Aerial colonies of subterranean termites <i>Coptotermes</i>, especially in boats (Rhinotermitidae) 	<ul style="list-style-type: none"> • Subterranean termites (except aerial colonies for <i>Coptotermes</i>) (Rhinotermitidae) • Dampwood termites (Kalotermitidae) • Carpenter ants (Formicidae) • Carpenter bees (Apidae)
<u>Beetles</u>	
Bostrichidae <ul style="list-style-type: none"> • Powderpost beetles (Lyctinae) • False Powderpost beetles (Bostrichinae) • Bamboo Powderpost beetle (Dinoderinae) 	<ul style="list-style-type: none"> • Lesser grain borer (Dinoderinae) ¹
Ptinidae ('Anobiid') <ul style="list-style-type: none"> • Deathwatch and furniture beetles (Anobiinae) 	<ul style="list-style-type: none"> • Drugstore beetles (Anobiinae) ¹ • Cigarette Beetle (Xyletininae) ¹
Cerambycidae <ul style="list-style-type: none"> • Old house borer 	<ul style="list-style-type: none"> • All other long-horned beetles ²
Anthribidae <ul style="list-style-type: none"> • Chickee hut beetle 	Buprestidae <ul style="list-style-type: none"> • All metallic flat-headed borers²
Dermestidae <ul style="list-style-type: none"> • Carpet beetles • Hide beetles 	<ul style="list-style-type: none"> • Larder beetles¹
	Curculionidae <ul style="list-style-type: none"> • Ambrosia and bark beetles (Scolytinae) ² • Pinhole Borers (Platypodinae) ² • Rice and Grain weevils (Dryophthorinae)¹
<u>Other pests</u>	
Decision for fumigation depends on the situation, the level of infestation and the customer	
<ul style="list-style-type: none"> • Bed bugs, cloth moths, cockroaches, roof rat, Norway rat, house mouse 	

¹May require commodity fumigation in flour mills, industrial food manufacturing, commodity transportation.

² Not wood re-infesting beetles, so no fumigation required.

Review questions for Chapter 2

1. Alate insects with a constricted waist, elbowed antenna and unequal wings are:
 - a. Drywood termites
 - b. Deathwatch beetles
 - c. Ants
 - d. Subterranean termites
 - e. All of the above
2. A drywood termite colony, when found:
 - a. Is often contained in a single piece of wood
 - b. May imply the presence of multiple independent colonies within a single structure
 - c. Is associated with dry six-sided fecal pellets of various colors
 - d. Have workers with a “sausage”-like appearance
 - e. All of the above
3. Among these pests, which one does NOT justify structural fumigation?
 - a. Drywood termites
 - b. Old house borers
 - c. Bark beetles
 - d. Powderpost beetles
 - e. None of the above
4. If you find a subterranean termite infestation, it presents the following characteristics:
 - a. No access to water, dry fecal pellet, contained in a single piece of wood
 - b. Mud tubes, often with contact to the soil for access to moisture
 - c. Very large termites, primarily found in trees, very rarely in structures
 - d. Unique soldier morphology with a cone-shape head
 - e. None of the above
5. Which target pest can be eliminated by fumigation without killing the eggs?
 - a. Powderpost beetles
 - b. Bed bugs
 - c. Drywood termites
 - d. None of the above
 - e. All of the above

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Chapter 3

Stewardship Requirements for Fumigators

The Florida Department of Agriculture and Consumer Services (FDACS) has enacted additional rules specific for residential fumigants registered in the Florida. A residential fumigant is labeled for structural fumigation of a residential area [\[5E-14.102 \(20\)\]](#). Currently, two sulfuryl fluoride (SF) products, Vikane® and Zythor®, are the only fumigants labeled for residential fumigation in Florida. These residential fumigants are also labelled for application to many other types of buildings, vehicles, structures, and materials. Other fumigants, including methyl bromide, phosphine formulations, and ProFume®, another SF product, are not labeled for residential fumigation and therefore are not regulated by the rules described below.

FDACS requires registrants of residential fumigants to provide the following to licensees who use these products [\[5E-2.0312\]](#).

- **A written Product Stewardship Policy** [\[5E-14.102 \(18\)\]](#). The policy must include a description of stewardship training, Quality Assurance Reviews (QARs), and procedures for issuing probation or stop sale notices to licensees.
- **Initial and Annual Stewardship Training.** Continuing Education Units (CEUs) must be provided for these training programs.
- **Annual QARs.** QARs are conducted at one or more fumigation sites for each licensee (e.g., fumigation company and branch) that uses the residential fumigant to observe the following:
 - Preparation of structure for fumigation.
 - Introduction of chloropicrin and the residential fumigant.
 - Initiation of aeration and active aeration.
 - Final clearance testing.

The **QARs** include verification that the following items are at the fumigation site:

- Secondary locks.
- Proper warning signs.
- Approved clearance devices.
- Label-required personal protective equipment, including two self-contained breathing apparatus (Self-Contained Breathing Apparatus , SCBA).

FDACS requires licensees to agree, in writing, to be in compliance with the Stewardship Policy requirements for the residential fumigant(s) they use, including having completed all required Stewardship Training (Initial or Annual) and QARs [\[5E-14.108 \(9\)\]](#). Licensees cannot purchase or perform fumigation using a residential fumigant unless they and their fumigation employees are in compliance with the Stewardship Policy requirements for the residential fumigant [\[5E-14.104 \(7\)\]](#). Fumigation employees required to comply with the stewardship policy and participate in the stewardship training include [\[5E-14.102 \(19\)\]](#):

- Certified Operators in the fumigation category.
- Special Identification Cardholders.
- Employee Identification Cardholders with the Fumigation Identification Card endorsement.

A fumigation employee cannot perform or assist in a fumigation using a residential fumigant unless the employee has completed all training required by the Stewardship Policy [\[5E-14.104 \(8\)\]](#). New fumigation employees must receive Initial Stewardship Training within 60 days of their first day of employment by the licensee if they did not receive that stewardship training earlier in the calendar year. Current employees of the licensee who transition to working as fumigation employees must receive Annual Stewardship Training within 60 days of receiving their new identification cards if they did not receive that stewardship training earlier in the calendar year [\[5E-14.108 \(9\)\]](#).

The Continuing Education Units for Stewardship Training (Initial or Annual) must be submitted to FDACS by the renewal date of the fumigation employee's identification card [\[5E-14.1421 \(5\)\]](#).

The registrant is required to place a licensee on probation or issue a stop-sale notice to a licensee if the registrant receives verifiable documentation that the licensee has failed to follow critical safety procedures. These procedures include the proper use of chloropicrin, SCBA, approved clearance devices, secondary locks and barricades, or any other safety procedure critical to the protection of workers, bystanders, homeowners, or the public as required by the residential fumigant label and Rule Chapters 5E-2 and 5E-14. The probation or stop sale is issued for six months but can terminate before six months if the licensee completes 1) all corrective actions recommended by the registrant, and 2) a QAR.

Review Questions for Chapter 3

6. The Florida Department of Agriculture and Consumer Services (FDACS) has enacted additional rules specific for residential fumigants registered in the Florida. These rules apply to the following fumigants:
 - a. Methyl bromide
 - b. Phosphine
 - c. Vikane® and Zythor®
 - d. ProFume®
 - e. All of the above
 - f. None of the above
7. FDACS requires registrants of residential fumigants to provide the following to licensees who use these products:
 - a. A written Product Stewardship Policy
 - b. Initial and Annual Stewardship Training
 - c. Annual Quality Assurance Reviews (QARs)
 - d. All of the above
 - e. None of the above
8. Fumigation employees who are NOT required to comply with the stewardship policy and participate in the stewardship training for residential fumigants include:
 - a. Certified Operators in the fumigation category
 - b. Any employee working on the tent crew not involved in fumigant introduction, initiating aeration and final clearance testing
 - c. Special Identification Cardholders
 - d. Employee Identification Cardholders with the Fumigation Identification Card endorsement
9. During a Quality Assurance Review, which of the following activities conducted by fumigation employees of the licensee are NOT required to be reviewed by a representative of the registrant for the residential fumigant:
 - a. Storage and transportation of the residential fumigant
 - b. Preparation of structure for fumigation
 - c. Introduction of chloropicrin and the residential fumigant
 - d. Initiation of aeration and active aeration
 - e. Final clearance testing
10. The registrant is required to place a licensee on probation or issue a stop-sale notice to a licensee if the registrant receives verifiable documentation that the licensee has failed to follow critical safety procedures.
 - a. True
 - b. False

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Chapter 4

Fumigant Formulations, Packaging, and Physical Properties

Sulfuryl fluoride (SF), phosphine (PH), and methyl bromide (MB) are the most commonly used fumigants for structural, commodity, and quarantine fumigations throughout the United States, including Florida. Chloropicrin (CP), a commonly used soil fumigant, is used as a warning agent with residential fumigants (SF; Vikane® and Zythor®). The formulations and packaging of these fumigants differ based on their unique chemical and physical properties.

Sulfuryl fluoride, MB, and CP are packaged as liquids in containers that contain at least 99% of the active ingredient and no other added ingredients such as solvents. Sulfuryl fluoride and MB are packaged in gas cylinders that are pressurized from the vapor pressure of these fumigants. Because the vapor pressure of SF is much greater than that of MB, the cylinder pressure of SF is higher, between 220 and 350 PSI (pounds per square inch) depending on temperature, compared to that of MB (15-35 PSI temperature dependent). The warning agent CP is not combined with SF (Vikane and Zythor) in cylinders because CP and SF do not mix evenly: the ratio of SF:CP released changes as the contents of the cylinder are applied. Also, the dosage of SF, but not that of CP, varies based on the target pest.

Unlike SF, MB, and CP, PH can be generated from a solid formulation, either aluminum phosphide or magnesium phosphide. These metallic phosphides react with water vapor in the fumigated space to generate, hydrogen phosphide gas, PH_3 . Magnesium phosphide produces phosphine more rapidly than aluminum phosphide, so magnesium phosphide is usually chosen when time is critical, or temperatures are lower. Unlike other fumigants, metallic phosphides leave a solid residue dust composed of reaction products with trace amounts of unreacted metallic phosphide.

Aluminum phosphide is commonly formulated as individual pellets or larger tablets. Non-toxic ammonium carbamate is added to certain formulations and reacts at the same time as the phosphide. Ammonium carbamate changes directly from a solid to the gaseous ammonia as a transient odorant and carbon dioxide that aids in suppressing flammability. These pellets/tablets are available in flasks or in pre-packaged, gas-permeable enclosures, such as ropes (Figure 4-1). The pre-packaged formulations enable faster application of a premeasured dose, retain the solid residues for easy removal after the fumigation, and are used when fumigating finished food products where contact with residue dust is not permitted. Magnesium phosphide is commonly formulated in inert, plastic plates or strips, covered on both sides with a moisture-permeable paper, which are also easily removed after the fumigation (Figure 4-2).



Figure 4-1. Packaging for aluminum phosphide ropes



Figure 4-2. Packaging for magnesium phosphide plates. A: metal container with B: sealed sets of plates. C: exposed plates. (Photos: S. Brantley)

Phosphine can also be applied directly to a commodity as a gas from metal gas cylinders or phosphine generators. Cylinder formulations of phosphine include ECO₂FUME® (Trademark of Solvay) containing 2% phosphine mixed with 98% carbon dioxide and VAPORPH₃OS® (Trademark of Solvay) containing 100% phosphine that is blended with carbon dioxide directly on-site during application. Phosphine generators mix powdered metallic phosphide formulations with water and air under controlled conditions to generate phosphine gas. Cylinderized or generated phosphine has multiple benefits compared with metallic phosphide formulations. The fumigator can apply phosphine at lower temperatures and drier conditions without entry into the fumigated space. Dosage accumulation is not delayed by gas evolution and no residue dust is created. Cylinderized and generated phosphine, compared to metallic phosphides, are more expensive, require more training to apply, and are not commonly used in Florida. Knowledge of the unique chemical and physical properties of SF, MB, PH, and CP enable the fumigator to understand why particular procedures must be followed during their use. These procedures ensure the safe and effective use of these fumigants without damage to the treated structures or commodities.

The boiling point is the temperature at a given pressure (usually atmospheric) when a liquid instantaneously changes into a gas. The lower the boiling point of a fumigant, the more rapidly the fumigant evaporates at room temperature without addition of heat. For cylinderized formulations of PH, SF and MB, the fumigant is introduced through chemically-resistant introduction hoses connected to the cylinder valves. For SF and cylinderized PH, the fumigator opens from the cylinder valves from outside the area to be fumigated. Due to its relatively high boiling point, 38°F (Table 4-1), MB is generally introduced through a heat exchanger to rapidly vaporize the liquid when fumigating commodities for quarantine and preshipment (Figure 4-3).

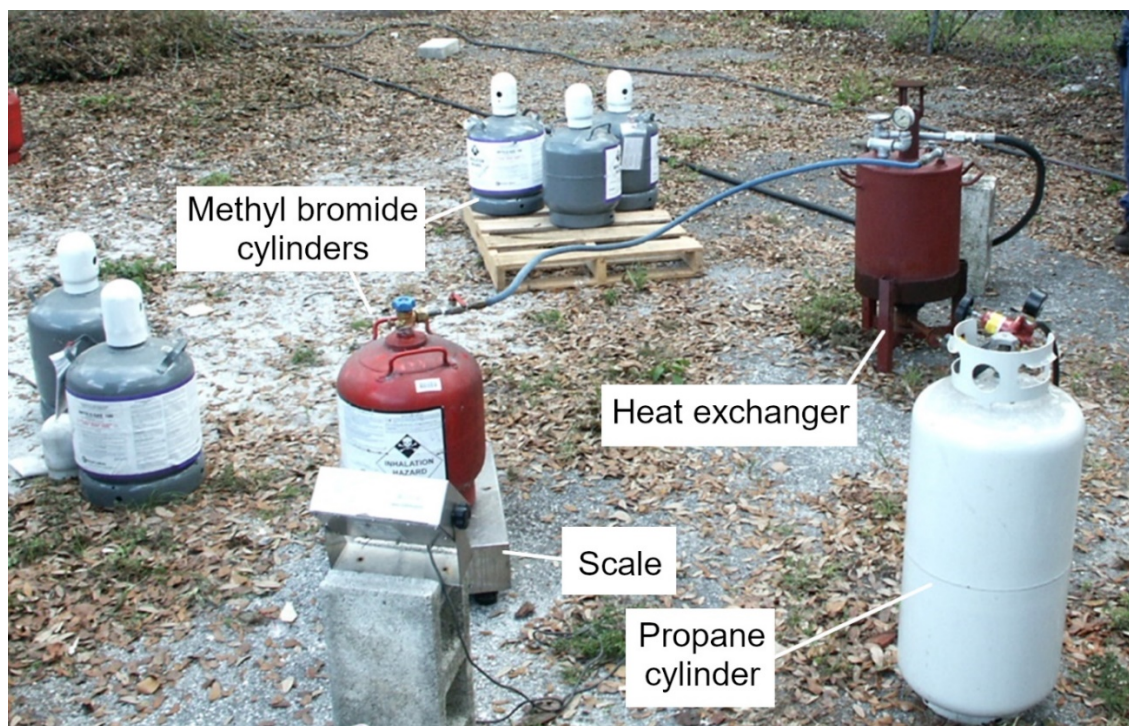


Figure 4-3. Heat exchanger for methyl bromide. (Photo: R. Scheffrahn)

Table 4-1. Physical and chemical properties of structural, commodity, and quarantine fumigants commonly used in Florida.

Properties	Methyl Bromide (CH ₃ Br)	Sulfuryl Fluoride (SO ₂ F ₂)	Phosphine (PH ₃)	Chloropicrin (CCl ₃ NO ₂) ¹
Specific gravity Air = 1	3.27 @32°F	2.88	1.21 @39.2°F	5.68
Boiling point (°F)	38.5	-67	125	234
Flammability	Nonflammable	Nonflammable	1.79% by volume of air	Nonflammable
Water solubility	15,444 ppm	750 ppm @ 77°F	416 ppm @ 63°F	1,621 ppm
Odor as gas	None (sweet odor in high concentrations)	None (sulfur odor in high concentrations)	Garlic-like odor due to byproduct; ammonia in certain formulations	Strongly irritating
Incompatibility – liquid or solid	Contact of liquid with aluminum, magnesium, zinc, and alkali metals may result in toxic gases, fire and explosion. Liquid incompatible with plastics, like polyvinyl, and may react with sulfur compounds to create malodors	Contact with liquid may damage glass and certain metals	Solid metal phosphide formulations can spontaneously ignite if contacted by water, acids, or chemicals	Liquid incompatible with aluminum, magnesium
Incompatibility - gas	Decomposes in flame, glowing filament to produce hydrogen bromide (HBr), that forms an acid in water that can etch glass and tile and corrode metal surfaces such as copper, silver, steel, brass, and aluminum	Decomposes in flame, glowing filament to produce hydrogen fluoride that forms an acid in water (see HBr effects above)	Can corrode copper, brass, copper alloys, and precious metals such as gold and silver	High concentrations corrosive in presence of moisture

¹ Used as a warning agent with sulfuryl fluoride residential fumigants (Vikane® and Zythor®)

In contrast, SF and cylinderized PH (such as Eco₂Fume which contains 2% phosphine and 98% carbon dioxide) have very low boiling points, -67°F and -125°F, respectively, and no heat exchanger is used during their introduction. Chloropicrin has a very high boiling point, 234°F. When used as a warning agent with SF, CP is released from a shallow container containing wicking material that is placed in the air stream of a fan (Figure 4-4). Research at the University of Florida has documented that about 1 hour, depending upon air flow rate and temperature, is required for CP to completely evaporate from the release container.

None of the currently used fumigants are flammable except for phosphine (Table 4-1). Phosphine gas may spontaneously ignite at concentrations of about 18,000 ppm or higher in the presence of oxygen. Treatment concentrations are much lower than this (typically less than 1000

ppm), so phosphine applied properly will not have a flammability risk. Problems with metallic phosphide can arise when tablets or pellets or plates are piled in contact with each other in small spaces. It is important that they stay out of wet conditions because direct water application can cause spontaneous ignition. Proper application of metallic phosphides is discussed in Chapter 13, Fumigant Introduction.

Fumigants as gases are relatively insoluble in water (Table 4-1). Water is often used to moisten soil around the exterior foundation of buildings to reduce soil diffusion of SF where the tarps are sealed to the ground.



Figure 4-4. "Pic-pan". Shallow container with wicking material placed in the air stream of a fan, for the chloropicrin introduction. (Photo: T. Chouvinc)

Chloropicrin is readily detectable as a gas, which is why it is used as a warning agent with residential SF fumigants. Chloropicrin is extremely irritating to eyes and respiratory mucous membranes at low concentrations, causing eye tearing at 0.3 ppm. By comparison, MB, SF and PH are odorless at working concentrations. High concentrations of these fumigants during application may have a distinct, transient odor (Table 4-1) caused by byproducts of the manufacturing processes. Metallic phosphide formulations with ammonium carbamate added will also generate detectable ammonia gas as a reaction product. Nonetheless, fumigators must understand that these odors occur unpredictably as an unintended result of formulation and manufacturing process. Odors cannot be relied upon to indicate the presence of these fumigants. Fumigators must always follow labeling directions for use of required low concentration detectors and respiratory protection when working with these fumigants.

Liquid SF, MB, and CP and metallic phosphides are incompatible with selective materials (Table 4-1). The most probable time for fumigants to contact these materials would be during fumigant introduction. Therefore, it is critical to follow all labeling directions for fumigant

introduction to avoid damaging fumigated commodities or structures (see Chapter 13, Fumigant Introduction).

Some fumigants in the gaseous state can adversely react with materials. Phosphine gas may react with copper, copper alloys, and precious metals, such as gold and silver, resulting in corrosion (Table 4-1). Corrosion is a function of phosphine concentration, relative humidity, and temperature. The damage of most concern is corrosion is in electrical equipment, electrical connections, and high-value electronic devices, such as computers and sensors. Labeling for PH recommends items to remove or protect from exposure (See Preparation Chapter).

Fumigants can also degrade under certain conditions to form decomposition products that are undesirable. Heat from glowing heat elements and open flames cause MB and SF to decompose, forming hydrogen bromide (HBr) and hydrogen fluoride (HF), respectively. HBr and HF are highly soluble in water, forming acids that can etch glass and tile and corrode metal surfaces such as copper, silver, steel, brass, and aluminum. Labeling for SF and MB require all flames to be extinguished and glowing heat elements to be turned off within the area to be fumigated before fumigant release (see Chapter 11, Preparation).

Review Questions for Chapter 4

11. Chloropicrin is used as a warning agent with:
- Methyl bromide
 - Phosphine
 - Vikane® and Zythor®
 - ProFume®
 - C and D
12. Sulfuryl fluoride, methyl bromide, and chloropicrin are packaged as liquids in containers that contain at least 99% of the active ingredient and no other added ingredients such as solvents.
- True
 - False
13. The fumigant which can be generated from a solid formulation is:
- Methyl bromide
 - Phosphine
 - Sulfuryl fluoride
 - Chloropicrin
 - None of the above
14. Fumigants as gases are very soluble in water.
- True
 - False
15. Water should not contact metallic phosphide formulations to avoid:
- Creating a fog out
 - Releasing a foul odor
 - Spontaneous ignition
 - None of the above
 - All of the above
16. Cylinderized formulations of sulfuryl fluoride and phosphine are introduced into a fumigated space:
- Through a chemically-resistant introduction hose
 - Through a hose attached to cylinder valves which the fumigator opens from outside the area to be fumigated
 - By first passing the fumigant through a heat exchanger
 - A and B
 - All of the above

17. High concentrations of sulfuryl fluoride, methyl bromide, and phosphine have a distinct, transient odor that can be reliably used by the fumigator to determine his/her exposure during fumigant introduction.
- True
 - False
18. The boiling point of sulfuryl fluoride is:
- 67F
 - lower than the boiling point of chloropicrin
 - the temperature at a given pressure when a liquid sulfuryl fluoride instantaneously changes into a gas
 - A and D
 - All of the above
19. The corrosion phosphine can cause in copper, copper alloys, and precious metals is dependent upon:
- The concentration of phosphine
 - The phosphine formulation
 - Relative humidity and temperature
 - A and C
 - All of the above
20. Etching glass and/or tile and corrosion of metal surfaces can occur during fumigation with methyl bromide or sulfuryl fluoride when these fumigants:
- Decompose in the high heat of glowing heat elements and open flames
 - Dissolve in moisture on these surfaces
 - Are applied at high concentrations
 - None of the above
 - All of the above

Chapter 5

Safety

Required Personal Protective Equipment, Symptoms of Exposure and First Aid

Unique characteristics of fumigants, such as toxicity to a broad range of living organisms and rapid diffusion to reach pests, make them excellent pest control tools but also make them hazardous to people and other non-target organisms. The possible routes of exposure to fumigants are inhalation, dermal (including eyes), and oral. The route of fumigant exposure of greatest concern is inhalation. For each fumigant, the EPA labeling specifies a maximum airborne fumigant concentration to which a person can be exposed ([Table 5-1](#)). These exposure limits are measured by fumigators in parts per million (ppm) using special low concentration devices (see Chapter 6, Low Concentration Detectors).

All fumigant labeling require fumigation workers to wear respiratory protection when exposed to fumigant concentrations that are unknown or are above maximum concentration permitted for exposure ([Table 5-1](#)). Labeling may also require respiratory protection be worn when conducting specific activities. Sulfuryl fluoride (SF) residential fumigants (Vikane® and Zythor®) require the fumigator wear respiratory protection when applying chloropicrin (CP) to more than two CP introduction points within a single fumigated structure. A positive pressure, self-contained breathing apparatus (SCBA) can be worn to protect from respiratory exposure to all fumigants ([Figure 5-1A](#)). Florida regulations require two properly functioning, positive pressure SCBAs must be available at the fumigation site at all times when fumigation workers are present and the structure is under fumigation (fumigant release, exposure period, aeration and at other times when state law or the fumigant labeling requires the use or presence of an SCBA) [\[5E-14.108\(6\)\]](#). Two SCBAs do not need to be present at the fumigation site for activities that do not involve worker exposure to fumigant concentrations above thresholds permitted by the fumigant labeling.

Specified cartridge/canister respirators ([Figure 5-1B](#)) are approved respiratory protection for low concentrations of methyl bromide (MB) and phosphine (PH) as follows: MB concentrations at or below 5 ppm (when work time restrictions are not followed per the quarantine treatment labeling requirements) and PH concentrations between 0.3 and 15 ppm.

Initial symptoms of over-exposure by inhalation can vary by fumigant and level of exposure ([Table 5-1](#)). General symptoms for overexposure to SF, MB, and PH include slowed movement and speech, nausea, and difficulty breathing. Chloropicrin (CP) is so irritating at low concentrations that unintentional overexposure is unlikely. Acute and lethal human exposure to these fumigants can result in death by fluid accumulating in the lungs, called pulmonary edema, and failure of the heart and circulatory system.

Table 5-1. EPA maximum airborne exposure limits, required respiratory personal protective equipment (PPE), symptoms of inhalation overexposure and first aid for sulfuryl fluoride, methyl bromide, phosphine, and chloropicrin.

Fumigant	Max Airborne Exposure Limit	Required Respiratory PPE	Symptoms of Inhalation Overexposure	First Aid for Inhalation Overexposure
Sulfuryl fluoride (SF)	1 ppm	Above 1 ppm: NIOSH ¹ or MSHA ² approved positive pressure self-contained breathing apparatus (SCBA) or combination air supplied/SCBA respirator	Nausea, difficulty breathing, abdominal pain, slowing of movements and speech, numbness in extremities	Get exposed person to fresh air. Keep warm and at rest. Make sure person can breathe freely. If breathing has stopped, give artificial respiration
Methyl bromide (MB)	5 ppm	0 – 5 ppm and work time restrictions are not followed: NIOSH certified half-mask or full- face piece air-purifying respirator with a cartridge certified by the manufacturer for protection from exposure to MB at concentrations up to 5 ppm Above 5 ppm: NIOSH approved SCBA	Nausea, dizziness, headache, vomiting, weakness, blurred vision, staggering gait	
Phosphine (PH)	0.3 ppm	Above 0.3 ppm - 15 ppm: NIOSH approved full-face mask-hydrogen phosphide canister combination Above 15 ppm: SCBA or equivalent	Nausea, dizziness, difficulty breathing, vomiting, diarrhea, headache, ringing of ears	
Chloropicrin (CP)	0.1 ppm	Above 0.1 ppm: NIOSH or MSHA approved positive pressure SCBA or combination air supplied/SCBA respirator OR when one fumigator is applying to more than two CP introduction points within a single fumigated structure.	Extreme irritation of mucous membranes	

¹ NIOSH = National Institute for Occupational Safety and Health ² MSHA = Mine Safety and Health Administration



Figure 5-1. A: Fumigator wearing a positive pressure self-contained breathing apparatus (SCBA) as respiratory protection from exposure to fumigants. B: specified cartridge/canister respirators are approved respiratory protection for low concentrations of methyl bromide and phosphine as specified by the fumigant labeling. (Photos: T. Chouvenc, S. Brantley)

First aid for inhalation overexposure to these fumigants requires moving the affected person to fresh air, giving chest compression, or using a pocket mask for artificial respiration if not breathing, and getting immediate medical assistance by calling “911”(Table 5-1). Immediate medical assistance is essential because even in life threatening exposures, the onset of acute adverse symptoms for these fumigants can be delayed for up to 24 hours for SF, two days for MB, and several days for PH. In addition, there is no antidote to reverse the adverse effects from overexposure to these fumigants. Physicians can only treat the symptoms.

Dermal and eye exposure to fumigants in the liquid or solid phase should be prevented. The most likely times for dermal and eye contact with liquid or solid fumigants are during application and when handling spent metallic phosphides. Personal protective equipment (PPE) to prevent dermal exposure vary based on fumigant (Table 5-2). Gloves and rubber boots should not be worn when applying SF and MB to prevent the liquids from being trapped against the skin. Chloropicrin does require chemically-resistant gloves be worn when applying the liquid due to the high boiling point of CP (Figure 5-2A). Dry cloth gloves are recommended be worn for PH (metallic phosphides) when exposure to dust may occur during application or disposal of spent dust. Methyl bromide, CP, and SF commodity fumigant (ProFume®) also require long sleeved shirt and long pants be worn during application. Dermal exposure to liquid SF produces frost-bite type damage (freeze burn) due to rapid evaporation of SF from the skin. Liquid MB and CP produce chemical burns (Figure 5-2B). Very high airborne concentrations of MB as a gas can also cause chemical burns. Dermal injury upon brief exposure to metallic phosphides is not expected.

Table 5-2. Dermal exposure (liquids or solids): required dermal personal protection equipment (PPE), symptoms of dermal exposure, and first aid for sulfuryl fluoride, methyl bromide, phosphine, and chloropicrin.

Fumigant	Required Dermal PPE	Symptoms of Dermal Exposure	First Aid for Dermal Exposure
Sulfuryl fluoride (SF)	Do not wear gloves or rubber boots ¹	Liquid - freeze burn	SF only: immediately apply water to contaminated area of clothing before removing (after area has thawed) All fumigants: remove contaminated clothing, shoes, and any other item on skin. Rinse skin immediately with plenty of water for 15-20 minutes Call a poison control center or doctor for further treatment advice
Methyl bromide (MB)	Long sleeved shirt and long pants; do not wear gloves, jewelry, or rubber boots	Liquid - chemical burn ²	
Phosphine ³ (PH)	Dry gloves of cotton or other material	Solid: dermal injury upon brief exposure is not expected	
Chloropicrin (CP)	Chemically-resistant gloves; long sleeved shirt and long pants	Liquid - chemical burn ²	

¹ SF Commodity fumigant (ProFume®) requires long-sleeved shirt and long pants.

² Extended exposures to high concentrations of methyl bromide in the gas phase can cause chemical burns.

³ Metallic phosphide formulations

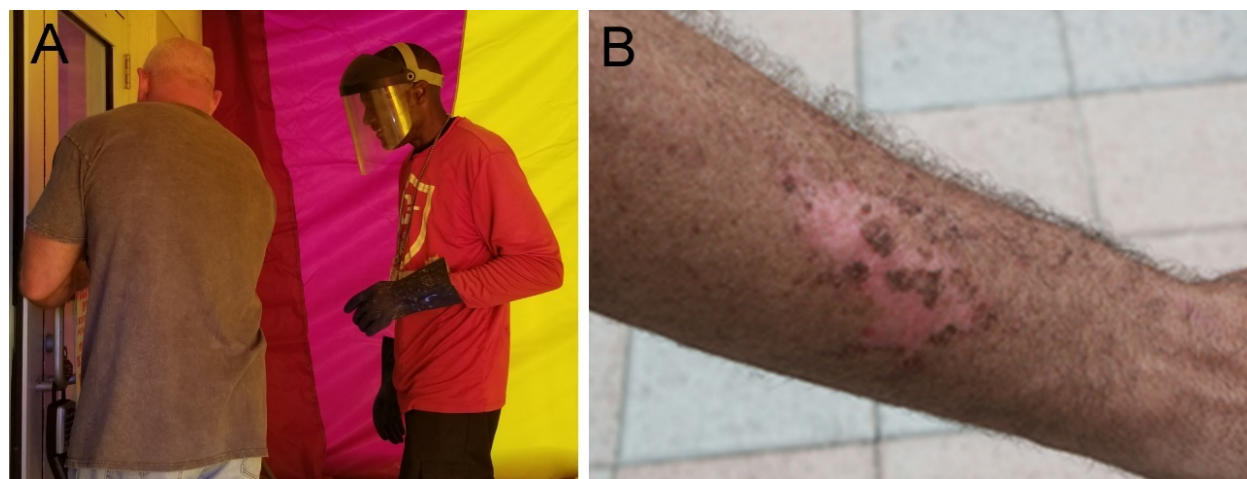


Figure 5-2. A: required personal protective equipment (PPE) when applying chloropicrin as a warning agent; full-face shield or safety glasses, chemically resistant gloves, long sleeved shirt, and long pants. An SCBA is required when the fumigator is applying chloropicrin at more than two introduction points within a single fumigated structure. B: chemical burn on forearm caused by contact with liquid chloropicrin. (Photos: T. Chouvinc, R. Scheffrahn)

General first aid for dermal exposure to liquid or solid fumigants requires removing contaminated clothing, shoes, and any other items on the skin, then rinsing the skin immediately with plenty of water for 15-20 minutes (Table 5-2). The exception is SF which can freeze clothing to the skin as the liquid SF rapidly evaporates. For SF dermal exposure, water should first be

applied to frozen clothing to thaw it before removal, followed by rinsing of the skin as described above. Except for metallic phosphides, fumigant labeling require eye protection be worn during fumigant introduction (Table 5-3). A full-face shield is approved eye protection for SF, MB, and CP (Figure 5-3). Splash-resistant goggles can be worn when applying SF, but are prohibited to be worn when applying MB and CP. For SF and MB, eye protection can also prevent potential mechanical injury if the introduction hose attached to the pressurized cylinder accidentally bursts or disconnects during fumigant introduction.



Figure 5-3. Full-face shield or splash-resistant goggles (insert picture) are personal protective equipment (PPE) required to be worn when applying all sulfuryl fluoride fumigants. (Photos: T. Chouvenc, Douglas Products)

Table 5-3. Eye exposure (liquids or solids): required dermal personal protection equipment (PPE), symptoms of eye exposure, and first aid for sulfuryl fluoride, methyl bromide, phosphine, and chloropicrin.

Fumigant	Required Eye PPE	Symptoms of Eye Exposure	First Aid for Eye Exposure
Sulfuryl fluoride (SF)	Full-face shield or splash-resistant goggles	Liquid - freeze burn	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 further treatment advice.
Methyl bromide (MB)	Protective eyewear (not goggles)	Liquid - chemical burn	
Phosphine ¹ (PH)	No eye protection required	Solid: irritation from dust	
Chloropicrin (CP)	Full-face shield or safety glasses (not goggles)	Liquid - chemical burn ²	

¹ Metallic phosphide formulations

² Chloropicrin is highly irritating to eyes in the gas phase.

Exposure of the eyes to fumigants in the liquid or solid phase produces injuries similar to those described for dermal exposure ([Table 5-3](#)). Spent dust from metallic phosphides can be highly irritating to the eyes. In addition, CP is very irritating to eyes as a gas, which is why it is used as a warning agent with SF residential fumigants.

First aid for eye exposure to liquid or solid fumigants is the same for SF, MB, PH, and CP; hold the eye open and rinse slowly and gently with water for 15-20 minutes ([Table 5-3](#)). If contact lenses are present, remove the contact lenses after the first 5 minutes, then continue rinsing the eye.

Ingestion is an unlikely route of exposure to SF due to its very low boiling point. First aid for ingestion of MB, metallic phosphides, and CP requires immediately calling 911 and a poison control center or doctor for treatment advice and to **not** induce vomiting unless told to do so by a poison control center or doctor. Labeling for MB and CP suggest having the person sip a glass of water if conscious and able to swallow.

Buffer Zones

The MB labeling requires a buffer zone be established around the fumigated site. Only fumigation workers are permitted inside the buffer zone. These workers may need to wear respiratory protection depending upon the MB concentrations and the time they spend working inside the buffer zone, as described in detail in directions and tables in the MB labeling.

The minimum distance for the MB buffer zone is 10 feet from the fumigated site, and increases based on the initial MB concentration, fumigant retention, duration of the fumigation, and size of the fumigated enclosure. The size of the buffer zone can increase during the fumigant treatment and aeration phases and is determined by using an [EPA website](#) per the MB labeling. The MB labeling has specific requirements and directions to use a low concentration monitor to measure MB concentrations outside the fumigation space during treatment and aeration. This monitoring is conducted to determine if the buffer zone is sufficient, and if respiratory protection is required for fumigation workers inside the buffer zone. These monitoring readings are required to be recorded.

Trained Persons Required to Use Fumigants

Fumigants are Restricted Use Pesticides (RUP), requiring use by or under the direct supervision of a certified applicator (= certified operator). The certified operator (CO) of fumigation or a special identification cardholder (SPID) must be present at times required by the fumigant labeling. Florida regulations require the CO or SPID also must be present to conduct the final inspection of the structure to be fumigated to confirm all label-required preparations are completed [\[5E-14.112\(1\)\]](#) and all persons have been vacated [\[5E-14.111\(4\)\]](#) and to conduct the final clearance testing before permitting re-occupancy of the fumigated structure [\[5E-14.113\(1\)\(2\)\]](#).

Two persons trained in the use of the fumigant are required by Florida regulations and fumigant labeling to be present during activities in the fumigation process when there is the greatest potential for worker exposure to the fumigant. At least one of these trained persons must be either a CO of fumigation or a SPID. The second trained person must be a CO of

fumigation, a SPID, or a an identification cardholder with a Fumigation Identification Card endorsement on the employee identification card (FID) [5E-14.108 (2)]. Two trained persons must be present at each fumigation site for the introduction of the fumigant, entry during fumigation, and from the start of aeration (first opening of the seal) until the active aeration period with all operable doors and windows open, if required by the fumigant labeling, is completed and the structure is secured for the remaining aeration period [5E-14.108(2)]. The labeling for MB and SF for food commodity fumigation (ProFume) also require two trained persons to be present when testing for re-entry after aeration.

Handling Leaks and Spills

The first priority of a fumigant leak or spill is to evacuate the immediate area, so unprotected persons are not over-exposed to the fumigant. Persons working to contain the leak or spill must wear the label-required respiratory PPE if fumigant levels exceed permissible exposure limits.

Fumigant leakage from SF and MB cylinders can occur during introduction if the hosing is not properly connected to the cylinder valve or if the hose breaks. Methods to prevent and correct this are discussed in Chapter 13, Fumigant Introduction. Fumigant leakage from cylinders can also occur when the valve is not completely closed, which can be caused by a loose packing nut. Tightening the packing nut following registrant directions can stop this leakage (Figure 5-4). If the cylinder leakage cannot be stopped, the fumigator should move the cylinder outdoors or to an isolated area, following all label-required safety precautions, and contact the emergency number on the fumigant labeling for further directions. It is a violation of the Florida Department of Transportation (FDOT) to transport a leaking cylinder on public roads.

When cleaning up spilled PH (metallic phosphide formulations), fumigators should wear dry gloves. Water should never be applied to cleanup spilled metallic phosphides because water can cause spontaneous ignition of metallic phosphides. When cleaning up spilled liquid CP, fumigators should wear chemically-resistant gloves, long sleeved shirts, and long pants. Vermiculite, dry sand, soil, or similar absorbent material can be used to absorb the spilled CP. These absorbent materials should then be thoroughly aerated outdoors before proper disposal. If CP is spilled on carpeting, wood floors, concrete, or other porous surfaces, irritating odors from desorbing CP can be very persistent and difficult to remove. Therefore, it is important to follow the following requirements and considerations for applying CP (see Chapter 13, Fumigant Introduction).

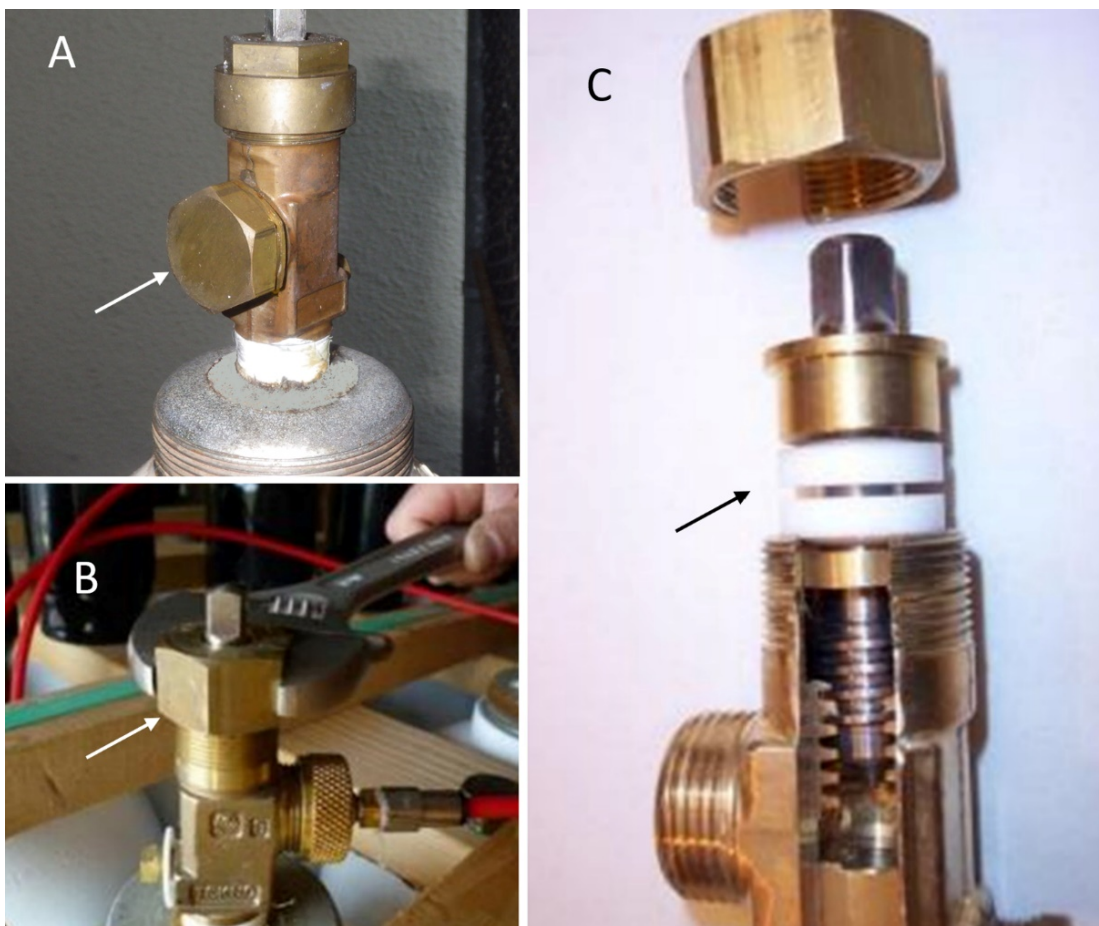


Figure 5-4. A loose packing nut may be the cause of a sulfuryl fluoride valve leak. A: valve cover. B: tightening the packing nut to stop fumigant leakage at the valve. C: packing washers. (Photos: R. Scheffrahn, Douglas products)

Disposal of Spent Metallic Phosphides

Unlike other fumigants, metallic phosphides leave a solid residue composed of reaction products with trace amounts of unreacted metallic phosphide. Because metallic phosphides may not be fully reacted, they require processing, using a dry or wet method, before disposal (**Figure 5-5**). These methods allow any residual metallic phosphide to finish reacting and the phosphine produced to be dissipated in the air. These methods should be conducted in a secure, well-ventilated area away from unprotected people. The dry method involves placing spent pellets or tablets, including pre-packaged products, in a ventilated container (metal or cloth bags depending upon the formulation) or spent plates or strips on dry ground away from water. The wet method involves submerging the spent material in uncovered containers of water. The amount of metallic phosphide to add to a given volume of water and the duration of the water processing varies based on the formulation and are specified in the product labeling. For pellet and tablet formulations, detergent or a surface active agent added to the water and thorough mixing are recommended. Plate and strip formulations must be held under water in wire cages or by use of a suitable weight because partially spent plates and strips may ignite if they float to the surface. Respiratory PPE may be required when conducting the wet method due to the rapid evolution of phosphine using this deactivation method.



Figure 5-5. Deactivation of spent metallic phosphide. Wet (left) and dry methods (right). (Photos: Degesch America)

Storage

All fumigants should be stored under lock and key in a dry, well-ventilated area posted for pesticide storage. Metallic phosphides should not be stored in areas where the temperature may exceed 130°F. Cylinders of SF and MB should be stored upright position with the safety caps and valve protection bonnets in place and secured to a rack or wall to prevent tipping. For SF residential fumigants, 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 SF monitoring device designed to alert occupants of the building if SF exceeds 1 ppm in the air of the storage area.

Transportation

The warning agent and SF, MB, and PH fumigants are classified as hazardous materials by the FDOT, which has specific requirements for transporting these materials (exceptions may be obtained for transporting small quantities of metallic phosphides). The FDOT requirements are very extensive and include the following (Figure 5-6):

- Hazardous materials must be secured within the vehicle so that they do not move during transport. Labeling for SF products require cylinders be transported in an upright position.
- Fumigants should always be transported in a separate air space from vehicle occupants.
- Cylinders must be transported with the valve cover and safety bonnet attached.
- Vehicles must be placarded on all four sides.
- The driver must have a commercial driver's license with a hazardous materials endorsement.
- A vehicle manifest and safety information on materials transported must be within reach of the seat-belted driver.



Figure 5-6. A: vehicle transport of sulfuryl fluoride cylinder; secure and upright, in separate airspace from vehicle occupants, and with valve cover and bonnet attached. B: placarding of vehicle transporting sulfuryl fluoride and chloropicrin; INHALATION HAZARD 2 (sulfuryl fluoride) placard (left) and the INHALATION HAZARD 6 (chloropicrin) placard (right). (Photos: Douglas Products)

- Important -

Fumigators should check with the Florida Department of Transportation (FDOT) to confirm all current requirements for transporting hazardous materials.

Review Questions for Chapter 5

21. The route(s) of fumigant exposure of greatest concern are:
- Dermal (including eyes)
 - Ingestion
 - Inhalation
 - A and C
 - All of the above
22. Sulfuryl fluoride residential fumigants (Vikane® and Zythor®) require the fumigator wear a self-contained breathing apparatus (SCBA) when applying chloropicrin (CP) to _____ CP introduction points within a single fumigated structure.
- One or more
 - More than one
 - More than two
23. General symptoms for overexposure to sulfuryl fluoride, methyl bromide, and phosphine by inhalation include:
- Slowed movement and speech
 - Euphoria
 - Difficulty breathing
 - A and C
 - All of the above
24. A positive pressure, self-contained breathing apparatus (SCBA) can be worn to protect the fumigator from respiratory exposure to all fumigants.
- True
 - False
25. Immediate medical assistance is required when a person is overexposed by inhalation to sulfuryl fluoride, methyl bromide, or phosphine because:
- There is no antidote to reverse the adverse effects from overexposure
 - Medical assistance is needed to treat the symptoms
 - The onset of acute adverse symptoms can be delayed for hours to days
 - A and B
 - All of the above
26. Chemically resistant gloves must be worn when applying:
- Methyl bromide
 - Chloropicrin
 - Metallic phosphides
 - Sulfuryl fluoride
 - B and C

27. Label-required eye protection that must be worn when applying sulfuryl fluoride is:

- a. Safety glasses or goggles
- b. Full-face shield or safety glasses
- c. Full-face shield or goggles
- d. All of the above

28. Label-required eye protection that must be worn when applying chloropicrin is:

- a. Safety glasses or goggles
- b. Full-face shield or safety glasses
- c. Full-face shield or goggles
- d. All of the above

29. Immediate first aid for dermal or eye exposure to liquid sulfuryl fluoride, methyl bromide, or and chloropicrin includes rinsing the skin or eyes with water for:

- a. 5 – 10 minutes
- b. 10 – 15 minutes
- c. 15 – 20 minutes
- d. No time is specified on the labeling

30. A buffer zone must be established around the fumigation site for:

- a. Methyl bromide
- b. Phosphine
- c. Sulfuryl fluoride
- d. A and B
- e. None of the above

31. The maximum airborne exposure limit for persons (not wearing respiratory protection) to sulfuryl fluoride is:

- a. 0.1 ppm
- b. 0.3 ppm
- c. 1 ppm
- d. 5 ppm

32. Two trained persons must be present at each fumigation site for:

- a. Introduction of the fumigant
- b. Entry during fumigation
- c. From the start of aeration (first opening of the seal) until the active aeration period with all operable doors and windows open, if required by the fumigant labeling, is completed
- d. All of the above

33. When two persons trained in the use of the fumigant are required by Florida regulations and fumigant labeling to be present at the fumigation site, at least one of these persons must be a certified operator of fumigation or a special identification cardholder.

- a. True
- b. False

34. Because metallic phosphides may not be fully reacted during fumigation and aeration, they require processing before disposal. This processing:

- a. Should be conducted in a secure, well-ventilated area away from unprotected people
- b. Should never involve exposure of spent metallic phosphides to water.
- c. Involves placing spent pellets, tablets, and pre-packaged products in a ventilated container or spent plates or strips on dry ground away from water
- d. A and C
- e. All of the above

35. Which of the following is a requirement when transporting fumigants like sulfuryl fluoride and methyl bromide?

- a. Fumigants should always be transported in a separate air space from vehicle occupants
- b. Cylinders must be transported with the valve cover and safety bonnet attached
- c. Vehicles must be placarded on all four sides
- d. A and B
- e. All of the above

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Chapter 6

Fumigant Low Concentration Detectors

Detection equipment capable of accurately measuring low fumigant concentrations is mandatory to confirm fumigant clearance after aeration. In Florida, each business licensee location performing fumigation must own at least two, label-approved, clearance devices so that at all times, a licensee has access to a properly functioning clearance device [5E-14.108 (7)]. The clearance devices must be calibrated in accordance with either the device manufacturer or the fumigant labeling directions, whichever is more restrictive.

Labeling for SF fumigants requires that an approved detection device of sufficient sensitivity must be used to confirm a concentration of sulfuryl fluoride SF of 1 ppm or less (Figure 6-1). Currently approved and available low concentration detectors for SF are the Interscan (Interscan Corporation), SF-ExplorIR (Spectros Instrument), CLIRcheck (Cardinal Professional Products), and FumiSpec Lo (Uniphos Envirotronic). The labeling for SF fumigants require that the Interscan must be calibrated according to manufacturer recommendations within one month before use as a clearance device.



Figure 6-1. Approved low concentration detection (e.g., clearance) devices for sulfuryl fluoride fumigants, used to confirm a sulfuryl fluoride concentration of 1 ppm or less. A: Interscan (Interscan Corporation) and low ppm SF cylinder required to conduct calibration of the Interscan. B: SF-ExplorIR (Spectros Instruments). C: CLIRcheck (Cardinal Professional Products). D: FumiSpec Lo (Uniphos Envirotronic). (Photos: respective companies)

All other approved detection devices must be calibrated according to manufacturers' recommendations at a time interval specified by the manufacturer. All these devices provide continuous readings and are battery operated. The SF-ExplorIR, CLIRcheck, and FumiSpec Lo directly measure the infrared light absorption of SF. By comparison, the Interscan combusts the SF gas sample in a furnace, releasing sulfur dioxide which is measured by a sensor and converted to the equivalent SF parts per million. Color diffusion tubes, described below for MB and phosphine (PH), are not approved as low concentration detectors for SF fumigants.

In Florida, licensees performing fumigations using an SF residential fumigant must ensure that all functioning and non-functioning SF clearance (e.g., low concentration) devices being used by the licensee are recorded within the department's electronic fumigation notification website [SE-14.108 (8)]. Information recorded on the website must include the name of the manufacturer, serial number, last known date of calibration and operational status of each device (Figure 6-2).

Florida Department of Agriculture and Consumer Services

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Clearance Device Search

Pest Control Company *

Pest Control Company License #

Device Manufacturer	Serial Number	Calibration Date	Person Calibrating	In Use?	Received Date	Expired Date	
SPECTROS EXPLORIR (365 Days)		5/16/2020		Y			Edit
SPECTROS EXPLORIR (365 Days)		12/2/2019		Y			Edit
SPECTROS EXPLORIR (365 Days)		8/20/2019		Y			Edit
SPECTROS EXPLORIR (365 Days)		8/12/2019		Y			Edit

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Figure 6-2 The [electronic fumigation notification website](#) of the Florida Department of Agriculture and Consumer Services which each licensee performing fumigations using a sulfuryl fluoride (SF) residential fumigant must record all functioning and non-functioning SF clearance devices being used by the licensee. (Source: FDACS)

Labeling for MB and PH do not require specific approved low concentration detectors. Commonly used detectors for MB and PH are color diffusion detector tubes, available from numerous manufacturers. These tubes utilize a pump to draw a specified volume of air through a tube containing a chemical reagent (**Figure 6-3**). The reagent changes color in the presence of the fumigant. The length of the stain or intensity of the color is proportional to the fumigant concentration. These colorimetric tubes are popular because they are simple to use, inexpensive, and do not require calibration. However, tubes can take only one reading per tube, have a limited shelf life, and their readings may be affected by temperature and humidity. A variety of electronic sensor technologies, such as infrared, electrochemical, and photoionization, are also available to measure low concentrations of MB or PH. These specific technologies are not discussed here due to their diversity and changing availability.

No low concentration detectors are required to test for clearance of chloropicrin (CP) when used as a warning agent for SF residential fumigants. There are several reasons for this. CP is applied at very low concentrations as a warning agent. These low CP concentrations are efficiently aerated by the SF aeration procedures. Chloropicrin concentrations above the permitted exposure limit produce eye irritation. Therefore, eye irritation that occasionally occurs after aeration and clearance of SF indicates additional aeration for CP is necessary (see Chapter 15, Aeration and Clearance Testing).



Figure 6-3. The fumigator, wearing a self-contained breathing apparatus (SCBA), is using a color diffusion detector tube connected to a pump apparatus to determine if the concentration of methyl bromide is 5 ppm or less after aeration of a fumigated commodity. (Photos: R. Scheffrahn)

“Leak detectors” are used to determine where fumigant may be leaking from confined fumigation spaces and include continuous monitoring halogen leak detectors for sulfuryl fluoride (SF) and methyl bromide (MB), such as the TIF detector. These leak detectors alert when the fumigant is present at concentrations above 25-50 ppm, but do not measure the actual fumigant concentration. Leak detectors are relatively inexpensive tools for identifying areas requiring additional sealing to improve fumigant confinement during exposure (**Figure 6-4**).



Figure 6-4. Use of a “leak detector” to determine if additional sealing is necessary. (Photo: R. Scheffrahn)

Review Questions for Chapter 6

36. Detection equipment capable of accurately measuring low fumigant concentrations is mandatory to confirm fumigant clearance after aeration.
- True
 - False
37. In Florida, each business licensee location performing fumigation must own at least _____, label-approved, clearance device(s) so that at all times, a licensee has access to a properly functioning clearance device.
- One
 - Two
 - Three
38. Which of the following is NOT an approved detection device of sufficient sensitivity (e.g., measures to 1 ppm sulfuryl fluoride) for sulfuryl fluoride fumigants:
1. Interscan
 2. SF-ExplorIR
 - c. CLIRcheck
 - d. SF-ReportIR
 - e. None of the above
39. Interscan must be calibrated according to manufacturer recommendations within _____ before use as a clearance device.
- One week
 - One month
 - Three months
 - One year
40. Color diffusion detector tubes, available from numerous manufacturers, are not permitted to be used test for low concentrations of methyl bromide and phosphine.
- True
 - False
41. When using color diffusion tubes, the _____ is proportional to the fumigant concentration.
- Speed of the color change
 - Length of the stain
 - Intensity of the color
 - B and C
 - All of the above

42. The disadvantage of using color diffusion tubes is:
- a. Only one reading can be taken per tube
 - b. The tubes have a limited shelf life
 - c. Tube readings may be affected by temperature and humidity
 - d. A and B
 - e. All of the above
43. No low concentration detectors are required to test for clearance of chloropicrin when used as a warning agent for sulfuryl fluoride residential fumigants.
- a. True
 - b. False

Chapter 7

Consumer Contracts for Fumigation

The Florida Department of Agriculture and Consumer Services (FDACS) requires specific agreement language between the consumer and the licensee (i.e., the pest control company).

1. Contract and Consumer Notice Form

Every company (licensee) must enter into a written contract with the property owner or agent before the commencement of the fumigation [\[5e-14.105\]](#). The written contract must be given to the property owner or agent before any commencement of work is done and before any payment. The contract shall contain the information included in this checklist (**Checklist 7-1**). The licensee must obtain specific written consent from the property owner or agent using the FDACS **Consumer Notice Form**, [\[FDACS-13692\]](#) (**Form 7-2**) before entering the contract.

If a licensee is subcontracting the fumigation work to another licensee he/she must notify the customer that the performance of the work may be assigned to another licensee. This written notification must be part of the contract as a separate statement or attached to the contract as a separate document and must be signed by the customer [\[5e-14.105\(d\)\]](#).

2. Consumer Consent Form

A licensee can not knowingly place a structure, currently under contract for control of a wood-destroying organism, under a second contract for the same wood-destroying organism for control or preventive treatment without first obtaining specific written consent signed by the property owner or authorized agent using the FDACS **Consumer Consent Form**, [\[FDACS-13671\]](#) (**Form 7-3**), [\[5E-14.105 \(7\)\]](#).

3. Fumigant Fact Sheet

The labeling for sulfuryl fluoride (SF) residential fumigants require that the fumigant **Fact Sheet** be provided before the parties enter into a fumigation agreement (e.g., a contract) (**Fact Sheets 7-4, 7-5**). The Fact Sheet must be provided to an adult occupant of the structure to be fumigated, including to an adult in each occupied unit in a multi-unit structure. The Fact Sheet reviews the fumigation process, the health effects of SF, safety precautions, and preparations to be taken before the fumigation. The residential fumigant described in the Fact Sheet provided to owner/occupants must be the same used to fumigate the structure, even if the fumigation is subcontracted to be conducted by another licensee [\[5E-14.108 \(10\)\]](#).

- Contract Checklist -

- The complete name and address of the property owner or authorized agent and the complete address of the property to be fumigated.
- All buildings or structures on the property to be fumigated.
- The complete name and business address of the licensee.
- The date upon which the written contract is entered into, the period of time covered by the contract, and renewal option, if any.
- The complete common name(s) of the wood-destroying organism(s) to be controlled under the contract. Any contract for the treatment of termites must clearly state on the first page if the contract covers subterranean termites, dry wood termites, or both. If Formosan termites (*Coptotermes formosansus*), or other invasive termite species, are to be excluded from coverage, the species must be named as such to be excluded.
- If an existing infestation is known to be present at the time of treatment, the treatment is for the control of an existing infestation.
- Whether or not reinspections are to be made under the contract and, if so, the approximate time intervals between reinspections, and fees other than renewal fees for same, if any.
- The conditions under which retreatments (for reinfestation) will be made; and conditions under which repairs will be made, if any.
- The total maximum price to be charged for the fumigation service, the exact annual renewal fees to be charged under the contract, if any; and the total maximum price to be charged for structural repairs, if any, shown separately.
- If the performance of the work is guaranteed by any type or form of bond, the obligations of the bond shall be set forth specifically: i.e., necessary retreatments, repairs, etc., in wording identical to that in the bond itself.
- The signature of the licensee or his authorized representative, and the signature of the property owner or authorized agent.

Checklist 7-1: Information that must be provided in a contract.



Florida Department of Agriculture and Consumer Services
Division of Agricultural Environmental Services

CONSUMER NOTICE FORM

NICOLE "NIKKI" FRIED
COMMISSIONER

Rule 5E-14.105, F.A.C.

A pest control company must give you a written contract prior to any treatment of each wood-destroying organism. It is very important that you read and understand the contract you are signing. The pest control company is only obligated to follow the terms of the contract you have signed, regardless of other statements by the company or salesperson. (Note: Contracts for treatment for new construction can be issued to the builder and provided to you at closing).

BASIC REQUIREMENTS FOR CONTRACTS

- The contract must state the common name of the wood-destroying organism to be controlled by the company (e.g. subterranean termite, powder post beetle). If the contract is for termite control, the contract must clearly state whether Formosan termites are covered or not.
- Some contracts do not include a treatment at the time the contract is issued, and that should be clearly stated. If a treatment is performed as part of the contract, the cost for the treatment must be stated. If the treatment is only for certain areas, the contract should clearly state that it is for "spot treatment" only.
- The contract must state if it is a retreatment only or a retreatment and repair contract. If it is a retreatment and repair contract, carefully read the sections of the contract that state when repairs will or will not be covered by the contract.

REQUIREMENTS FOR STATING WHEN TREATMENT OR REPAIR WILL NOT BE COVERED BY THE CONTRACT

- Repair contracts will not cover repairs from termite damage under every condition. The contract must state when retreatment or repair will be done, and conditions under which the company can refuse to retreat or repair.
- These conditions have to be stated and be under headings in the contract that are in bold print. Companies typically refuse repair or retreatment if the condition of the house is such that moisture or leaks result in termite infestation, or where siding makes it hard to see termite infestation

Examples of this are:

- Cracks in concrete slabs
- Wood or wall siding in contact with ground
- Plumbing leaks
- Leaks in the roof
- Water accumulating against side of house

The law does require that companies notify you if they see conditions which would void the repair promise and they have to give you a chance to correct the condition before voiding the contract or denying repair coverage.

- Contracts may have a condition that does not cover Formosan termite damage until a specific time period has passed. This means that if damage occurs during this period the company will not pay for repair.
- You have the right to compare contracts from other companies before signing a contract with a company. Choose the company that gives you the best contract options.
- If you have any questions about the terms of the contract, or concerns about the compliance history of the company with regard to pest control laws or regulations, contact the Department of Agriculture and Consumer Services at phone number: 850-617-7996 or email: biircomplaints@fdacs.gov.

I understand that I am entering into a contract with _____ (fill in company name) to provide wood-destroying organism(s) treatment, and I have read and understood the terms of the contract.

Print Name of Consumer

Date: _____

Signature of Consumer

Title: Property Owner or authorized agent

Print Name of Pest Control Representative

Date: _____

Signature of Pest Control Representative

Company: _____



Florida Department of Agriculture and Consumer Services
Division of Agricultural Environmental Services

Formulario de Aviso al Consumidor

NICOLE "NIKKI" FRIED
COMMISSIONER

Rule 5E-14.105, F.A.C.

Una compañía de control de plagas debe proveerle con un contrato escrito antes de comenzar cualquier tratamiento para organismos destructores de madera. Es muy importante que usted lea y entienda el contrato que esta por firmar. La compañía de control de plagas solo esta obligada a seguir los terminus del contrato que usted haya firmado, independientemente de cualquier otra explicacion o afirmacion hecha por el vendedor de la compañía. (Nota: El Contrato para el tratamiento de nuevas construcciones pueden ser expedido al contratista y le sera entregado al cierre de la negociacion).

REQUERIMIENTOS BASICOS PARA CONTRATOS

- El contrato debe establecer el nombre comun del organismo destructor de madera a ser tratado por la compañía (ej. Termitas subterranas, escarabajo de la madera). Si el contrato es para el control de termitas, el mismo debe claramente establecer si la termite Formosan esta o no cubierta.
- Algunos contratos no incluyen un tratamiento al momento de expedir el mismo y eso debe estar claramente establecido. Si un tratamiento es realizado como parte de un contrato, el costo por ese tratamiento debe ser especificado. Si el tratamiento es solo para algunas areas, esto tambien debe estar estipulado dentro del contrato como "Tratamiento Localizado" solamente.
- El contrato debe establecer si solo cubre tratamientos o si cubre tratamientos y reparaciones. De ser un contrato para tratamientos y reparaciones, lea cuidadosamente las secciones del contrato que establecen que tipo de reparaciones seran o no cubiertas por el contrato.

REQUERIMIENTOS QUE ESTABLECEN CUANDO UN TRATAMIENTO O REPARACION NO SERA CUBIERTO POR EL CONTRATO.

- Los contratos de reparaciones no cubriran los danos ocasionados bajo distintas circunstancias por termitas. El contrato debe establecer cuando el tratamiento o reparacion sera realizado y las condiciones bajo las cuales la compañía pudiera rechazar tartar la plaga o reparar el dano.
- Esas condiciones deben ser establecidas y resaltadas como titulo en el contrato. Las compañías tipicamente rehusan reparar danos or tratar plagas si la casa presenta condiciones de humedad o grietas que permiten la presencia de termitas a un nivel de infestacion, o cuando los revestimientos de paredes dificulte detectar la presencia de termitas.

Ejemplos de esto es:

- Grietas en losas de concreto
- Madera o revestimiento de paredes en contacto con el suelo.
- Fugas de plomeria.
- Goteras en el techo
- Acumulacion de agua contra un costado de la casa.

La ley no requiere que las compañías le notifiquen si ellos observan alguna(s) condicion(es) que pudiera anular la clausula de reparacion y deben darle una oportunidad para corregir cualquier anomalidad antes de anular el contrato o negar la cobertura de reparacion.

- Los contratos pueden presentar una clausula donde los danos producidos por termitas Formosan no son cubiertos hasta un periodo de tiempo previamente establecido por el mismo. Esto significa que si el dano ocurre durante ese periodo de tiempo establecido la compañía no pagara las reparaciones necesarias.
- Usted tiene el derecho de comparar contratos de otras compañías antes de firmar un contrato con una de ellas. Elija la compañía que le provea las mejores opciones.
- Si usted tiene alguna duda o pregunta acerca de los terminos del contrato o alguna duda o preocupacion acerca del record historico de trabajo de la compañía con respecto a las leyes y regulaciones para el control de plagas, por favor contacte el Departamento de Agricultura y Servicios al Consumidor al numero telefonico: 850-617-7996 o escribanos al email:biircomplaints@fdacs.gov.

Entiendo que estoy aceptando el contrato establecido por _____ (coloque el nombre de la compañía) para el tratamiento de organismo(s) destructor de madera, y he leído y entendido los terminos del mismo.

Imprima el Nombre de Consumidor

La fecha: _____

La firma de Consumidor

El título: El Dueño de la propiedad o autorizó a agente

Imprima el Nombre de Representante de Control de Peste

La fecha: _____

La firma de Representante de Control de Peste

La compañía: _____

(El inglés en la frente)



Florida Department of Agriculture and Consumer Services
Division of Agricultural Environmental Services

CONSUMER NOTICE FORM

NICOLE "NIKKI" FRIED
COMMISSIONER

Rule 5E-14.105, F.A.C.

A pest control company must give you a written contract prior to any treatment of each wood-destroying organism. It is very important that you read and understand the contract you are signing. The pest control company is only obligated to follow the terms of the contract you have signed, regardless of other statements by the company or salesperson. (Note: Contracts for treatment for new construction can be issued to the builder and provided to you at closing).

BASIC REQUIREMENTS FOR CONTRACTS

- The contract must state the common name of the wood-destroying organism to be controlled by the company (e.g. subterranean termite, powder post beetle). If the contract is for termite control, the contract must clearly state whether Formosan termites are covered or not.
- Some contracts do not include a treatment at the time the contract is issued, and that should be clearly stated. If a treatment is performed as part of the contract, the cost for the treatment must be stated. If the treatment is only for certain areas, the contract should clearly state that it is for "spot treatment" only.
- The contract must state if it is a retreatment only or a retreatment and repair contract. If it is a retreatment and repair contract, carefully read the sections of the contract that state when repairs will or will not be covered by the contract.

REQUIREMENTS FOR STATING WHEN TREATMENT OR REPAIR WILL NOT BE COVERED BY THE CONTRACT

- Repair contracts will not cover repairs from termite damage under every condition. The contract must state when retreatment or repair will be done, and conditions under which the company can refuse to retreat or repair.
- These conditions have to be stated and be under headings in the contract that are in bold print. Companies typically refuse repair or retreatment if the condition of the house is such that moisture or leaks result in termite infestation, or where siding makes it hard to see termite infestation

Examples of this are:

- | | |
|--|--|
| • Cracks in concrete slabs | • Leaks in the roof |
| • Wood or wall siding in contact with ground | • Water accumulating against side of house |
| • Plumbing leaks | |

The law does require that companies notify you if they see conditions which would void the repair promise and they have to give you a chance to correct the condition before voiding the contract or denying repair coverage.

- Contracts may have a condition that does not cover Formosan termite damage until a specific time period has passed. This means that if damage occurs during this period the company will not pay for repair.
- You have the right to compare contracts from other companies before signing a contract with a company. Choose the company that gives you the best contract options.
- If you have any questions about the terms of the contract, or concerns about the compliance history of the company with regard to pest control laws or regulations, contact the Department of Agriculture and Consumer Services at phone number: 850-617-7996 or email: biircomplaints@fdacs.gov.

I understand that I am entering into a contract with _____ (fill in company name) to provide wood-destroying organism(s) treatment, and I have read and understood the terms of the contract.

Print Name of Consumer

Date: _____

Signature of Consumer

Title: Property Owner or authorized agent

Print Name of Pest Control Representative

Date: _____

Signature of Pest Control Representative

Company: _____



Florida Department of Agriculture and Consumer Services
Division of Agricultural Environmental Services

Formulario de Aviso al Consumidor

NICOLE "NIKKI" FRIED
COMMISSIONER

Rule 5E-14.105, F.A.C.

Una compañía de control de plagas debe proveerle con un contrato escrito antes de comenzar cualquier tratamiento para organismos destructores de madera. Es muy importante que usted lea y entienda el contrato que esta por firmar. La compañía de control de plagas solo esta obligada a seguir los terminus del contrato que usted haya firmado, independientemente de cualquier otra explicacion o afirmacion hecha por el vendedor de la compañía. (Nota: El Contrato para el tratamiento de nuevas construcciones pueden ser expedido al contratista y le sera entregado al cierre de la negociacion).

REQUERIMIENTOS BASICOS PARA CONTRATOS

- El contrato debe establecer el nombre comun del organismo destructor de madera a ser tratado por la compañía (ej. Termitas subterranas, escarabajo de la madera). Si el contrato es para el control de termitas, el mismo debe claramente establecer si la termite Formosan esta o no cubierta.
- Algunos contratos no incluyen un tratamiento al momento de expedir el mismo y eso debe estar claramente establecido. Si un tratamiento es realizado como parte de un contrato, el costo por ese tratamiento debe ser especificado. Si el tratamiento es solo para algunas areas, esto tambien debe estar estipulado dentro del contrato como "Tratamiento Localizado" solamente.
- El contrato debe establecer si solo cubre tratamientos o si cubre tratamientos y reparaciones. De ser un contrato para tratamientos y reparaciones, lea cuidadosamente las secciones del contrato que establecen que tipo de reparaciones seran o no cubiertas por el contrato.

REQUERIMIENTOS QUE ESTABLECEN CUANDO UN TRATAMIENTO O REPARACION NO SERA CUBIERTO POR EL CONTRATO.

- Los contratos de reparaciones no cubriran los danos ocasionados bajo distintas circunstancias por termitas. El contrato debe establecer cuando el tratamiento o reparacion sera realizado y las condiciones bajo las cuales la compañía pudiera rechazar tartar la plaga o reparar el dano.
- Esas condiciones deben ser establecidas y resaltadas como titulo en el contrato. Las compañías típicamente rehusan reparar danos or tratar plagas si la casa presenta condiciones de humedad o grietas que permiten la presencia de termitas a un nivel de infestacion, o cuando los revestimientos de paredes dificulte detectar la presencia de termitas.

Ejemplos de esto es:

- Grietas en losas de concreto
- Madera o revestimiento de paredes en contacto con el suelo.
- Fugas de plomeria.
- Goteras en el techo
- Acumulacion de agua contra un costado de la casa.

La ley no requiere que las compañías le notifiquen si ellos observan alguna(s) condicion(es) que pudiera anular la clausula de reparacion y deben darle una oportunidad para corregir cualquier anomalidad antes de anular el contrato o negar la cobertura de reparacion.

- Los contratos pueden presentar una clausula donde los danos producidos por termitas Formosan no son cubiertos hasta un periodo de tiempo previamente establecido por el mismo. Esto significa que si el dano ocurre durante ese periodo de tiempo establecido la compañía no pagara las reparaciones necesarias.
- Usted tiene el derecho de comparar contratos de otras compañías antes de firmar un contrato con una de ellas. Elija la compañía que le provea las mejores opciones.
- Si usted tiene alguna duda o pregunta acerca de los terminos del contrato o alguna duda o preocupacion acerca del record historico de trabajo de la compañía con respecto a las leyes y regulaciones para el control de plagas, por favor contacte el Departamento de Agricultura y Servicios al Consumidor al numero telefonico: 850-617-7996 o escribanos al email:biircomplaints@fdacs.gov.

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Imprima el Nombre de Consumidor

La fecha: _____

La firma de Consumidor

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Imprima el Nombre de Representante de Control de Peste

La fecha: _____

La firma de Representante de Control de Peste

La compañía: _____

VIKANE®

Fact Sheet For Vikane® Gas Fumigant (Sulfuryl Fluoride)

Vikane® Gas Fumigant

In the interest of Douglas Products' commitment to product stewardship, this fact sheet is intended to provide basic information about the product and how it is used. If you have specific questions about your fumigation, refer to documents provided by the fumigator or call the fumigator listed on the warning signs posted on your structure. If you have questions about Vikane gas fumigant (the fumigant used) or the procedures described, call the Douglas Products Customer Information Center at 844-8VIKANE (844-884-5263).

Why Buildings Are Fumigated

Insects that feed or tunnel into wood can seriously damage houses, apartments, and other dwellings or structures. Each year termites or other wood destroying insects damage more than 5 million homes. Other pests, such as bed bugs, may be dispersed throughout rooms and can be difficult to locate and control quickly and completely. Depending on the extent or location of the infestation, fumigation is the only total control method proven to eliminate certain infestations of wood destroying insects, bed bugs, and other structure-infesting pests.

How Buildings Are Fumigated

Because Vikane is a gas, prior to fumigation, the structure is completely sealed. This serves to contain Vikane in the building so it can penetrate wood and building contents to thoroughly eliminate the pests. Depending on the construction of the building, the doors and windows may be sealed with tape and a plastic sheet, or the structure may be covered with a tarp. The building will remain sealed for 2-72 hours depending on the specifics of the job. Warning signs are posted around the building notifying people to keep out.

After the fumigation period is completed, a professional fumigator will aerate the structure using fans for a prescribed aeration period. Once the dwelling has been thoroughly aerated, the fumigator is required to measure the level of any fumigant remaining in the living space to ensure it is below the EPA approved concentration for reentry by the occupants.

Extremely low levels of fumigant can remain for a short period of time in dead air spaces between walls and inside cabinets as well as porous materials such as furniture. The small amount of fumigant in these areas will continue to dissipate for a few hours after the fumigation but at levels well below the established safe reentry concentration. Your building will not be cleared for reoccupancy until it is safe to enter. The fumigator will post a notice on your building indicating the day and time for reentry. Structures can be occupied only when the concentration is 1 part per million or less (this represents a margin of safety – laboratory animals have been exposed to 100 parts per million for 2 weeks with no adverse effects). Because Vikane is a true gas and not a vapor, aeration is rapid. Recent studies demonstrated that in most structures levels are less than 1 part per million after the prescribed aeration period and have no detectable levels of Vikane within 24 hours after the start of aeration.

Sulfuryl fluoride is a colorless, odorless gas, so a warning agent is added to the building that causes watery eyes and a scratchy throat. If you experience these symptoms in a structure that has been recently fumigated, you should leave immediately and call the pest control company to have your building retested.

Sulfuryl Fluoride [Potential Health Risks From Overexposure]

Sulfuryl fluoride is a gas that can potentially enter your body only through inhalation. Because it is a gas, it does not stay on dry surfaces; therefore, there is no exposure from touching treated surfaces.

Nervous System And Respiratory Irritation

Overexposure to high levels of sulfuryl fluoride can result in nose and throat irritation and nausea. At high concentrations (such as those used during the fumigation) it can cause excess fluid in the lungs, sleepiness, pneumonia, and convulsions. These symptoms would be expected to appear within 8 hours after such an exposure. In the unlikely event you experience these symptoms in the building that has been recently fumigated, you should leave immediately. Consult your physician and call the pest control company to have your building retested.

Additional Studies

Sulfuryl fluoride has not been shown to cause birth defects in pregnant animals exposed under experimental conditions. In addition, current studies have demonstrated there are not mutagenic or genotoxic effects caused by exposure to sulfuryl fluoride.

Questions

If you have specific questions about your fumigation, refer to documents provided by the fumigator or call the fumigator listed on the warning signs posted on your structure. Call the Douglas Products Customer Information Center at 844-8VIKANE (844-884-5263) if you need additional information or have questions concerning this product.

Safety Precautions And Homeowner Preparation

- Discuss the treatment program in advance with your pest control company so you fully understand what will be done and what you need to do.
- Carefully follow the instructions you are given about what items you are to remove from your building.
- Stay out of the treated building until it is cleared by your pest control company for reentry.
- If you are interested or concerned, you should ask your pest control company to show the records of how your building was aerated before it was cleared for reentry.
- You may wish to increase ventilation by opening doors and windows.

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Vikane is a federally Restricted Use Pesticide. Always read and follow label directions.

These materials have been created specifically for Vikane gas fumigant and no other structural fumigant. These materials may not be copied, in whole or in part, or reproduced without the permission of Douglas Products.

U01-069-146 (9/17) BR

Fact sheet 7-3 (cont.)

VIKANE®

Hoja de Datos Para el Gas Fumigante Vikane® [Fluoruro de Sulfurilo]

El Gas Fumigante Vikane®

Cumpliendo con el compromiso de Douglas Products en la administración de sus productos, esta hoja de datos tiene como fin proporcionar información básica sobre el producto y sobre su uso. Si tiene preguntas específicas sobre su fumigación, consulte los documentos proporcionados por el fumigador o llame al fumigador que aparece en las señales de advertencia colocadas en su estructura. Si usted tiene preguntas sobre el gas fumigante Vikane® (el fumigante que es usado) o los procedimientos descritos, llame al Centro de Información del Cliente de Douglas Products al 844-8VIKANE (844-884-5263).

Por Qué Se Fumigan los Edificios

Los insectos que se alimentan o hacen túneles en la madera pueden dañar seriamente las casas, apartamentos y otras viviendas o estructuras. Cada año las termitas u otros insectos destructores de madera dañan más de 5 millones de casas. Otras plagas, como los chinches, tienden a dispersarse a través de los cuartos y es difícil ubicarlas y controlarlas rápida y completamente. Dependiendo de la extensión o ubicación de la infestación, la fumigación es el único método de control total comprobado para eliminar ciertas infestaciones de insectos destructores de madera, chinches y otras plagas que infestan las estructuras.

Como Se Fumigan los Edificios

Debido a que Vikane es un gas, la estructura es sellada antes de la fumigación. Esto ayuda a contener el gas Vikane en el edificio para que pueda penetrar en la madera y en el contenido del edificio para eliminar completamente las plagas. Dependiendo de la construcción del edificio, las puertas y ventanas pueden sellarse con cinta adhesiva y membrana de plástico, o la estructura entera puede ser cubierta con una lona o carpa. El edificio permanecerá sellado durante 2 a 72 horas, dependiendo de las especificaciones del trabajo. Alrededor del edificio se colocaran señales de advertencia para notificar a las personas que se mantengan afuera del edificio.

Después de completar el período de fumigación, un fumigador profesional ventilará la estructura utilizando ventiladores por un período de aeración establecido. Una vez que la vivienda ha sido ventilada completamente el fumigador debe medir el nivel de fumigante presente en el espacio habitable para asegurar que esté debajo de la concentración aprobada por la EPA (Agencia de Protección Ambiental) para que los ocupantes puedan volver a entrar. Niveles extremadamente bajos del fumigante pueden permanecer por un período corto en espacios entre las paredes y dentro de los gabinetes, así como en los materiales porosos como los muebles. La pequeña cantidad de fumigante en estas áreas se seguirá disipando durante unas horas después de la fumigación pero a niveles por debajo de la concentración segura establecida para el reingreso. La entrada a su edificio no puede permitirse hasta que esté libre de peligro. El fumigador colocará una notificación en su edificio en la que se indicará el día y hora para el reingreso. Las estructuras se pueden ocupar sólo cuando la concentración es de 1 parte por millón o menos (esto representa un margen de seguridad, los animales de laboratorio se han expuesto a 100 partes por millón durante 2 semanas sin tener efectos adversos). Debido a que Vikane es un gas verdadero y no un aerosol, la ventilación es rápida.

Estudios recientes demostraron que en la mayoría de las estructuras los niveles son de menos de 1 parte por millón después del período de ventilación establecido y no tienen niveles detectables de Vikane en el plazo de 24 horas después del inicio de la ventilación.

El fluoruro de sulfurilo es un gas incoloro e inodoro, debido a esto, al usarlo el fumigador necesita introducir un agente de advertencia al edificio, el cual ocasiona irritación en los ojos y en la garganta. Si usted siente estos síntomas en una estructura que se ha fumigado recientemente, debe salir inmediatamente y llamar a la compañía de control de plagas para que vuelvan a examinar el edificio.

Fluoruro de Sulfurilo (Potenciales Riesgos de Salud Debido a una Exposición Excesiva)

El fluoruro de sulfurilo es un gas y solamente es posible que entre en su cuerpo sólo por medio de la inhalación. Por ser un gas, no permanece en superficies secas; por lo tanto, no hay exposición al tocar las superficies tratadas.

Irritación Respiratoria Y Del Sistema Nervioso

Una exposición excesiva a niveles altos de fluoruro de sulfurilo, puede ocasionar irritación de la nariz y garganta y náusea. En concentraciones altas (como aquellas utilizadas durante la fumigación) puede provocar exceso de líquido en los pulmones, somnolencia, neumonía y convulsiones. Se espera que estos síntomas aparezcan en un plazo de 8 horas después de dicha exposición. En la remota posibilidad de sufrir estos síntomas en un edificio que se haya fumigado recientemente, usted debe salir inmediatamente. Consulte con su médico y llame a la compañía de control de plagas para que vuelvan a examinar el edificio.

Estudios Adicionales

No se ha demostrado que el fluoruro de sulfurilo provoque defectos genéticos en animales gestantes expuestos bajo condiciones experimentales. Además, los estudios actuales han demostrado que no hay efectos mutagénicos o genotóxicos ocasionados por la exposición al fluoruro de sulfurilo.

Preguntas

Si tiene preguntas específicas sobre su fumigación, consulte los documentos proporcionados por el fumigador o llame al fumigador que aparece en las señales de advertencia colocadas en su estructura. Llame al Centro de Información del Cliente de Douglas Products al 844-8VIKANE (844-884-5263) si necesita información adicional o tiene preguntas con respecto a este producto.

TermiteTenting.com



®Marca comercial del Douglas Products

Vikane es un pesticida de uso federalmente restringido.

Estos materiales se han creado para el gas de fumigación Vikane® y para ningún otro fumigante estructural. La información contenida en este material está basada en la etiqueta del producto y las instrucciones de uso de Vikane y no es para uso con ningún otro fumigante estructural el cual tendrá diferentes requerimientos en la etiqueta del producto. No está permitida la copia o reproducción de estos materiales sin la autorización de Douglas Products.

U01-069-147 (9/17) BR

Preparación del Propietario y Precauciones de Seguridad

- Dialogue con anticipación el programa de tratamiento con su compañía de control de plagas para que usted entienda completamente lo que se realizará y lo que debe hacer.
- Siga cuidadosamente las instrucciones que se le dan sobre los artículos que debe sacar del edificio.
- Manténgase fuera del edificio tratado hasta que la compañía de control de plagas autorice el reingreso.
- Si está interesado o tiene alguna inquietud, debe solicitar a su compañía de control de plagas que le muestre los registros de cómo se ventiló su edificio antes de autorizar el reingreso.
- Si usted desea, puede aumentar la ventilación de su vivienda por un periodo adicional abriendo puertas y ventanas al reingresar.

VIKANE®

Fact sheet 7-4 (cont.)

Structure Occupant Fact Sheet Fumigant Preparation Checklist

You have decided to have your property fumigated and your fumigator has chosen to use Zythor Fumigant. The information provided here is intended to provide you with some basic information about Zythor Fumigant and why and how it is used. Also, before a fumigation with Zythor can commence, there are certain steps that must be taken to prepare your property and protect certain of its contents. Some of these steps must involve action on your part. You will find here a full explanation of what you need to do to get ready.

If you have questions that are not answered here, please refer to other information you may have been given by your fumigator or call your fumigator. If you have specific questions about Zythor that your operator is unable to answer, call us at 1-866-367-8467.

WHAT IS ZYTHOR?

Zythor is the tradename for our brand of sulfuryl fluoride fumigant gas. The molecular formula is SO_2F_2 . Sulfuryl fluoride is an inorganic compound (does not contain carbon). It is a good choice as a fumigant because it has high penetrating power plus it does not adversely react with items normally found within structures. It is non-staining, non-corrosive and non-flammable. And it does not deplete the ozone layer.

WHY FUMIGATE TO CONTROL CERTAIN INSECTS?

Fumigation is the only method of insect control able to kill a target insect regardless of its location in the structure. Sulfuryl fluoride fumigant gas penetrates to every possible point of the structure where an insect may be found. Wood destroying insects can do considerable amounts of damage to a structure. Some of these insects inhabit structures in a way that make fumigation the only reliable method of elimination.

HOW ARE STRUCTURES FUMIGATED?

The objective of fumigation is to create a sealed space in which the target insects are located, and fumigant gas can be confined. In most cases this is accomplished by covering the structure in a gas tight tent. Warning signs are posted on the exterior along with special locks on doors to prevent entry. The confinement period and concentration of sulfuryl fluoride within the structure are predetermined using a specialized calculator. This calculator takes into account a number of factors including the target insect and the temperature inside the structure.

WHAT HAPPENS AFTER THE FUMIGATION IS COMPLETED?

At the end of the fumigation the seal on the structure is broken allowing the remaining gas to escape into the atmosphere. Aeration occurs for a predetermined amount of time and is normally aided by opening windows and using fans. Sulfuryl fluoride dissipates rapidly from open air spaces in the structure. However, it will take longer to dissipate from dead air spaces such as wall voids, below and behind cabinets, and from within porous materials such as wood.

HOW DO YOU MAKE SURE THE LEVEL OF SULFURYL FLUORIDE IN THE AIR HAS FALLEN TO A SAFE LEVEL FOR RE-OCCUPANCY?

Your fumigator will use a specialized monitoring device to measure the amount of sulfuryl fluoride remaining in the structure. If the concentration of gas in the air is above an EPA mandated clearance level (1ppm) the aeration period will be continued. The EPA mandated clearance level of 1ppm was determined based on studies using laboratory animals that showed no adverse effects from one week of continuous exposure to 100ppm of sulfuryl fluoride.

WHY DO FOOD ITEMS NEED TO BE PROTECTED AGAINST EXPOSURE?

Before a food item can be exposed to sulfuryl fluoride it must be tested to show that no harmful residues are left behind. This testing has been done for sulfuryl fluoride for only a few food items. As a safety measure no food items can be exposed to Zythor.

IS IT POSSIBLE TO BE EXPOSED TO SULFURYL FLUORIDE AS A RESULT OF MY PROPERTY BEING FUMIGATED?

Exposure to excess concentrations of sulfuryl fluoride from having your property fumigated is highly unlikely. Symptoms of overexposure include nose and throat irritation, nausea, excess fluid in lungs, sleepiness, pneumonia, and convulsions. These symptoms would appear within 8 hours of overexposure. In the event that you experience these symptoms immediately leave the structure and call your fumigator and physician. Sulfuryl fluoride has not been shown to cause birth defects and studies have demonstrated that it is not mutagenic or genotoxic.

WHAT ELSE SHOULD I KNOW?

Sulfuryl Fluoride is colorless, odorless, and gives no sensory warnings. A small amount of warning agent called chloropicrin is placed in the structure prior to the release of fumigant gas. Chloropicrin can cause watering of the eyes and scratchiness of the throat at very low levels in the air. Upon completion of the aeration process it is possible for minute amounts of chloropicrin to remain in the air. If you experience these symptoms contact your fumigator.

USING FUMIGUARD BAGS

Fumiguard bags are made from a special nylon based film-like material that is highly resistant to the passage of Zythor gas. In order to adequately protect the contents placed inside the bag, the bags must be packed and sealed according to the following directions. Bags can be placed inside refrigerators and freezers.

Only use Fumiguard bags to protect items against exposure to Zythor. Regular garbage-type plastic bags do not provide protection.

Keep Fumiguard bags out of the reach of children.



Step 1: Packing a Bag

Place items to be protected inside a Fumiguard bag. Fill the bag only half to two-thirds full to allow it to be closed properly.

Step 2: Closing the Bag

Twist the top of the bag tightly into a long neck.



Step 3: Sealing the Bag

Double the twisted neck of the bag over on itself and secure it with a twist tie, tape, string or rubber band.



Step 4: Double Bagging

Place the sealed bag inside of a second bag. Secure this second bag according to steps two and three.



Step 5: Testing the Seal

Test the seal of the outer bag by pushing gently against its sides and listening for an air leak.



Before the fumigation of a structure with Zythor can be conducted, certain preparatory steps must be taken to ensure the safety and effectiveness of the fumigant. Close adherence to these steps can help ensure this.

It is your responsibility to perform these preparatory steps before the fumigation crew arrives. The fumigation cannot proceed until all items on this list that are applicable to your structure are completed.

Fumigated structures must be locked during the fumigation period. Make arrangements to leave the keys to the structure with your fumigator and to retrieve them afterwards.

Electricity must be on for the fumigation to be performed. It is needed to power the fans that circulate Zythor throughout the structure.

INTERIOR PREPARATIONS

Things that must be removed from the structure:

- All persons, living plants and non-target animals including those on outdoor patios that would be under or close to the fumigation tent.
- Mattresses and pillows with waterproof covers that cannot be removed (not waterbeds). Items fitting this description that are not removed will be removed by your fumigator.

Things that must either be protected from exposure to the fumigant or removed from the structure:

Any food, beverage, drug, medicinal or toiletry item that is consumed or put in the mouth that is not within its manufacturer's original factory sealed airtight container must be removed from the structure or specially sealed within gas tight Fumiguard bags provided by your fumigator. Items to be sealed include food within your refrigerator or freezer. Once properly bagged, items from the refrigerator or freezer can be replaced there for the duration of the fumigation. Items that must be removed or bagged that are not removed or bagged may be trashed by your fumigator.

Bag or remove these items:

- Food packed in plastic bags such as chips, pasta and rice even if they have not been opened
- Food packed in cardboard boxes such as cereal and crackers even if they have not been opened
- Spices and salt and pepper shakers where the seal has been broken
- Dairy products and eggs
- Ice and drinking water
- Any item stored in a resealable container
- Produce
- Pet food and bird seed in bags
- Tobacco products

Things that do not need to be bagged or removed:

- Dental hygiene products, including toothpaste, mouthwash, dental adhesives, denture cleanser and tooth whitening products
- Unopened plastic, metal or glass cans, jars or bottles
- Shampoo, soap, cosmetics, externally applied lotions and ointments.
- Unopened bottles of liquor and wine sealed with a cork when stored horizontally.
- Clothes

Things that must be turned off and/or extinguished:

- Heating and air conditioning system (The fan in the air conditioning system may be used by your fumigator at different times during the fumigation to circulate the Zythor.)
- Burglar alarm
- Gas at the main valve or tank (Some states require that this must be done by the gas company.)
- Heating elements in heaters, pianos and organs
- Pilot lights in heaters, hot water heaters, ovens, ranges, broilers, gas refrigerators, dryers, automatic lighting systems, gas lamps, etc. (Your fumigator will not be responsible for relighting pilot lights.)
- Automatic lighting and appliance controls

Other preparations:

- Unlock and open all cabinets, drawers, closets, attic accesses and interior doors. Safes and locked storage areas must be left unlocked or keys/combinations must be provided to your fumigator.
- Remove vehicles from garages and carports. (Unlock and open trunk if they cannot be moved.)
- Unzip plastic garment bags.
- Raise blinds and open drapes.
- Remove valuables such as jewelry and furs and empty safes

EXTERIOR PREPARATIONS

The evening before the fumigation, thoroughly water the soil around shrubs and plants immediately adjacent to the structure and the soil within 18 inches of the structure. This is intended to protect these items from damage from fumigant seeping into the ground around the structure. There is no guarantee that this will completely protect these plants from damage.

- Move items and trim trees sufficiently to allow the fumigation tent to fall freely from the roof straight down to the ground.
- Mulch, rocks, stones or debris may have to be moved in order to create points where the fumigation tent can rest firmly against the ground. Ask your fumigator exactly what needs to be done to make these preparations yourself. If instead you allow your fumigator to move these items, there is no guarantee they will be placed back in the original area or configuration.
- Fences and other abutments to the structure that extend more than 5 feet out from the structure may need to be detached in order to drop the tent to the ground. Your fumigator will inform you if this is the case, and if a craftsman such as a carpenter or bricklayer is needed to make alterations.
- Retract any awnings, valences or shades.
- Remove (as requested) any TV antenna guidewires.

SPECIAL NOTE ABOUT CATS

Be particularly careful to make sure that no cats, including neighbor's cats, are left within or under the structure during the fumigation. If there is a space in or under your house that cats can occupy without your knowledge you may want to notify neighbors with cats when your house is going to be fumigated.

THINGS FOR WHICH YOUR FUMIGATOR CANNOT BE RESPONSIBLE

- Broken roof shingles or tiles, patio covers, gutters, antennas, electrical wires or solar heater panels
- Damage caused by the application and removal of tape to a painted or plaster surface of the structure
- Vandalism, theft or breaking and entering at the structure (The structure is not guarded during the fumigation period. At your option you may guard the structure yourself or make arrangements to hire a guard service.)
- Damage to trees, shrubs or plants due to breakage or exposure to the fumigant
- Damage to plant and vine trellises
- The weather, which may delay the fumigation if unsafe conditions such as high wind or lightning are present or expected or if low temperatures occur that would make the fumigant less effective.
- Damage to doors that must be secured by nailing shut that cannot be properly locked

THINGS YOU SHOULD TELL YOUR FUMIGATOR

- Advise your fumigator if there are any connections between the structure and another structure such as conduits, ducting, drain lines, vacuum lines or tunnels that could possibly allow the passage of fumigant from the fumigated structure to another structure. Severe injury or death could result.
- Normally, all operable windows will be opened by your fumigator after the structure is tented and will remain open until the initial aeration procedure is completed. Let your fumigator know if any windows cannot be opened.

AFTER THE FUMIGATION IS COMPLETED

- Do not attempt to reenter the structure until you are told by your fumigator that the structure is clear for reentry.
- If you are interested or concerned, you should ask your fumigator to show you the records of how your structure was aerated before it was cleared for reentry.
- It is not necessary to wash dishes, linens or clothes exposed to Zythor.
- You may wish to increase ventilation of your structure by opening doors and windows for a period of time after your return. This may reduce the chances of encountering any residual chloropicrin warning agent.

HOW TO PROPERLY AND SAFELY PREPARE YOUR HOME FOR FUMIGATION INSTRUCTIONAL VIDEO



<https://bit.ly/2OUpmiF>



<https://bit.ly/2EijEVR>

Structure Occupant Acknowledgement

I certify that all items on this Preparation Checklist applicable to my structure have been completed:

Signature: _____

Date: _____

If you have any questions, please contact your fumigator at:

Review Questions for Chapter 7

44. The Florida Department of Agriculture and Consumer Services (FDACS) requires that the company (licensee) must enter into a written contract with the property owner or agent before _____ and the commencement of the _____.
- Payment, inspection
 - The inspection, fumigation
 - Payment, fumigation
 - None of the above
45. Before the property owner or agent enters into a written contract for a fumigation, they must sign a _____ and be provided with a _____.
- Liability release, Fumigation Fact Sheet
 - FDACS Consumer Notice Form, Fumigation Fact Sheet
 - FDACS Consumer Notice Form, Fumigation Preparation Checklist
 - All of the above
46. Which of the following is NOT required by FDACS on a fumigation contract:
- The complete name of the Certified Operator in charge of the fumigation
 - The complete address of the property to be treated
 - The complete name and business address of the licensee
 - The conditions under which retreatments (for reinfestation) will be made
47. The FDACS Consumer Consent Form is required to be signed by the property owner or agent before a fumigation is conducted for a pest not listed on the fumigant labeling.
- True
 - False
48. The Fumigation Fact Sheet for sulfuryl fluoride residential fumigants:
- Is provided before the parties entering into a fumigation agreement
 - Must be provided to an adult occupant of the structure to be fumigated
 - Must be provided to an adult occupant of each occupied unit in a multi-unit structure to be fumigated
 - B and C
 - All of the above

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Chapter 8

Fumigation Notification and Documentation

All sulfuryl fluoride (SF) fumigants, phosphine (PH), and methyl bromide (MB) are labeled as “Restricted Use Pesticides” (RUPs) due to their inhalation toxicity. No RUPs are available for sale to or use by the general public. An RUP classification restricts these fumigants for sale to and use only by Certified Applicators (i.e., Certified Operators, CO) or persons under their direct supervision and only for those uses covered by the Certified Applicator’s certification. There are labeling and state rule requirements for notification and documentation of the use of these RUP fumigants.

Notification

Each licensee must notify the the Florida Department of Agriculture and Consumer Services (FDACS) at least 24 hours before conducting a fumigation [5E-14.110]. Notification of less than 24 hours to the website is allowed only for verifiable situations affecting the health, safety, and welfare of the public and severe weather conditions. The notification is made using the FDACS electronic fumigation notification website, fumigation.freshfromflorida.com (Figure 8-1) and includes the following information:

- Fumigation company name and business location address.
- Contractor’s name (if subcontracted).
- Accepted common or trade name and active ingredients of fumigant to be used.
- Name of CO or Special Fumigation Identification Card holder (SPID) for the fumigation, and his/her day and night telephone numbers.
- Location (address), county, and type of structure (single family, multi-family, commercial, or other) and number of structures to be fumigated.
- Date of fumigation.
- Approximate duration of fumigation.
- Target pest.

Any changes in information in submitted notices, such as cancelling or rescheduling the fumigation, must be reported on the fumigation notification website.

A licensee that performs chamber fumigations on the premises of the licensee’s licensed business location must notify the department annually of these fumigations using the FDACS electronic fumigation notification website. The type of chamber(s) used, and the days per week and hours per day when these fumigations may occur are reported in this annual notification.

Documentation - SF Residential Fumigants


For SF residential fumigants (Vikane® and Zythor®), the CO is required to use the Fumigation Log form [FDACS-13000, 01/17] (Figure 8-2) or a log form that incorporates all information in the FDACS form [5E-14.142(3)]. Information recorded in the FDACS log form includes:

- Name and license number of the CO or SPID responsible for the fumigant application.
- Name of the person who applied the fumigant.
- Date and time of the following: fumigant introduction, start of aeration, completion of aeration, and final testing for clearance.
- Location of the treatment site.
- Detailed information relating to each label required activity period (e.g. sealing, initial aeration, and clearance testing), including names of employees and personnel involved and start and stop times.
- Total volume of the fumigated space.
- Brand name or Environmental Protection Agency (EPA) registration number of the fumigant applied.
- Total amounts, in pounds or ounces, of the fumigant and warning agent applied.

The fumigation log form must be retained in the fumigation company records for two years from the date of the fumigation.

Documentation - Commodity Fumigants

The labeling for commodity fumigants, SF (ProFume®), phosphine (PH), and MB Q (Quarantine label), require use of a Fumigation Management Plan (FMP). A FMP is an organized, documented description of the steps involved to help ensure a safe, legal, and effective fumigation. The FMP is site specific, is prepared before the fumigation, and is updated and revised throughout the fumigation. Therefore, the FMP is used to plan a fumigation and to document what was done during the fumigation. Suggested information to record in a FMP is reviewed in the labeling for each commodity fumigant. In addition, FMP templates for commodity fumigants can be obtained online through various sources, such as fumigant distributors, university and government agencies, and pest control associations.



Nicole "Nikki" Fried
Commissioner

[NOF Search](#)
[NOF Entry](#)
[Reports](#)
[Clearance Device](#)
[Calibration](#)
[Report of Fumigation Vault](#)
[Operations](#)

Florida Department of Agriculture and Consumer Services

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Notification of Fumigation

Company Performing the Fumigation

Company License # * Company Name

Company Address

Fumigant Trade Name * Fumigant Active Ingredients

Certified Operator in Charge of Fumigation * Day Phone * Night/Emergency Phone *

If Subcontracted, Select Contracting Company (Required) *

Site/Description of Property

Street Address of Property *

City * Zip Code * County * Date of Fumigation *

Number of Structures to be Fumigated * Approximate Duration of Fumigation (hrs) * From To Target Pest * Reason for Less than 24 Hour NOF

Type of Structure * Other Type of Structure *

Structure Use * Other Structure Use *

[Employment](#)
[FAQs](#)
[Site Map](#)
[Website Help](#)








Figure 8-1. Screen image of Fumigation Notification website; each licensee must notify the the Florida Department of Agriculture and Consumer Services using this website at least 24 hours before conducting a fumigation.



Florida Department of Agriculture and Consumer Services
Division of Agricultural Environmental Services

FUMIGATION LOG

NICOLE "NIKKI" FRIED
COMMISSIONER

Rule 5E-14.142, F.A.C.
Telephone: (850) 617-7996; Fax: (850) 617-7981

Respond to:
Bureau of Inspection and
Incident Response
3125 Conner Blvd, Suite N,
Tallahassee, FL 32399-1650

Fumigation Company:		License #:	
Fumigation Site Address:			
Date & Time of Arrival:	AM/PM	Target Pest:	
Type of Structure:	Frame Crawl <input type="checkbox"/> Masonry Crawl <input type="checkbox"/>	Garage Attached <input type="checkbox"/>	
	Frame Slab <input type="checkbox"/> Masonry Slab <input type="checkbox"/>	Garage Detached <input type="checkbox"/>	
TENT UP INFORMATION - List All Personnel/ Crew Members Involved			
Name of COIC - Fumigation:	Credential #:	COIC Phone #:	
Name of SPID:	Credential #:		
Name of Crew Member:	Credential #:		
Name of Crew Member:	Credential #:		
Calculator Used:	<input type="checkbox"/> Yes <input type="checkbox"/> No	Hours Exposure	OZ-Hr Required
Dosage Factor		Relative Humidity	
Tarp Condition		Amp per fan	Pic Total (oz)
Seal Condition			Number of Pic Sites
Wind (mph)		Estimated HLT	Ounces per Site
Volume (MCF)		Dosage (oz/MCF)	
Underseal		Gas Required (Lb)	
Temperature (F)		Max Release Rate	
INTRODUCTION INFORMATION -			
Fumigant Used	Pounds Applied:	Cylinder #	
Time of Release	AM/PM	Lot #	
TEAR DOWN INFORMATION - List All Personnel/ Crew Members Involved			
Name of COIC - Fumigation:	Credential #:	COIC Phone #:	
Name of SPID:	Credential #:		
Name of Crew Member:	Credential #:		
Name of Crew Member:	Credential #:		
Date :	Arrival Time:	Time Seal Broken:	AM/PM
Active 1 hour Aeration	Start	Passive Aeration	Start
	Finish		Finish
CLEARANCE INFORMATION - Structure cleared to 1ppm or less			
Date:	Detector Used:		
Time:	Last Calibration Date:		
Cleared by:	Credential #:		
Job Monitored? <input type="checkbox"/> Yes <input type="checkbox"/> No -- If Monitored -- Readings: in oz/1000 ft³			
Location:	Equilibrium Readings ¹ AM/PM	Interim Readings ² AM/PM	Terminal Readings AM/PM
	Hours Elapsed Between Readings ³	Actual HLT (hr)	
1)			
2)			
3)			
4)			
5)			
Average:			
¹ Use Function 1 if your first readings are not at equilibrium ² Recommended 3-6 hr after equilibrium ³ Hr between equilibrium and terminal readings			
Correction Information (additional gas in lbs, if needed):			
COMMENTS/ISSUES REGARDING THIS JOB:			

FDACS-13000 01/17

Figure 8.2. Screen image of Fumigation Log Form; each job must have this log form, or a form that contains this information, for each fumigation performed. These must be retained for 2 years.

Review Questions for Chapter 8

49. _____ is labeled as a Restricted Use Pesticide due to its inhalation toxicity.
- a. Methyl bromide
 - b. Sulfuryl fluoride
 - c. Phosphine
 - d. A and B
 - e. All of the above
50. A Restricted Use Pesticide can only be sold to and used by:
- a. A Special Identification Cardholder in Fumigation
 - b. A Certified Applicator
 - c. Persons under the direct supervision a Certified Applicator and only for those uses covered by the Certified Applicator's certification
 - d. B and C
 - e. All of the above
51. Each licensee must notify the the Florida Department of Agriculture and Consumer Services (FDACS) at least _____ before conducting a fumigation.
- a. 12 hours
 - b. 24 hours
 - c. 48 hours
 - d. 72 hours
52. Notification of FDACS of a fumigation to be conducted in less time than that required in question #51 is only permitted due to:
- a. Health, safety, and welfare of the public
 - b. Severe weather conditions
 - c. Real estate transactions
 - d. A and B
 - e. All of the above
53. Each licensee must notify the FDACS by:
- a. Using the FDACS electronic fumigation notification website
 - b. Sending a text notification to their local FDACS inspector
 - c. Sending an e-mail to their local FDACS inspector
 - d. None of the above
 - e. All of the above

54. Which of the following information is NOT required by FDACS in the fumigation notification:
- a. Fumigation company name and business location address
 - b. Date of the fumigation
 - c. Cost of the fumigation
 - d. Location address, including county
 - e. Type of structure and number of structures to be fumigated
 - f. Common or trade name of the fumigant to be used
55. FDACS does not require submitted fumigation notices be updated if the fumigation is cancelled or rescheduled.
- a. True
 - b. False
56. FDACS requires that a Certified Operator use a Fumigation Log Form to document fumigations using:
- a. Methyl bromide
 - b. Any Sulfuryl fluoride fumigant
 - c. Phosphine
 - d. Sulfuryl fluoride residential fumigants
 - e. All of the above
57. Information on the Fumigation Log Form includes:
- a. Name and license number of the Certified Operator or Special Identification Cardholder responsible for the fumigant application
 - b. Location of the treatment site
 - c. Brand name of fumigant applied
 - d. Date and time for start and completion of aeration
 - e. All of the above
58. A Fumigation Management Plan, required for commodity fumigants, is an organized, documented description of the steps involved to help ensure a safe, legal, and effective fumigation.
- a. True
 - b. False

Chapter 9

Measurement and Fumigation Inspection Graph

The initial inspection of an infested structure is the foundation for the whole fumigation process. It will dictate the timing, resources, and special considerations needed to conduct a successful fumigation. This phase includes the identification of the target pest (Chapter 2, Target Pests), nature and location of the infestation, volume to be fumigated, special building details and equipment considerations, customer consultation, and cost estimate or contract execution. The Florida Department of Agriculture and Consumer Services (FDACS) requires that pest control persons who inspect for wood-destroying organisms (WDOs) be trained and supervised by a Certified Operator (CO) for WDO, even when inspecting for WDOs such as drywood termites that may require a fumigation for control.

Fumigation Inspection Graph

It is important that pest control personnel conducting WDO inspections know how to properly measure, calculate the structure volume, and document a structure to be fumigated in a fumigation inspection graph. The graph is used for recording measurements needed to calculate the volume of the structure (Figure 9-1). It is advised that the CO or Special Identification Cardholder (SPID) responsible for the fumigation verify that the volume of the structure depicted in the fumigation inspection graph is accurate before calculating the fumigant dose. Identification of the pest and location of the infestation should also be documented on a schematic graph of the structure. If accessibility does not allow inspection in an area where an infestation is likely, the location of possible “hidden damage” should be noted on the graph.

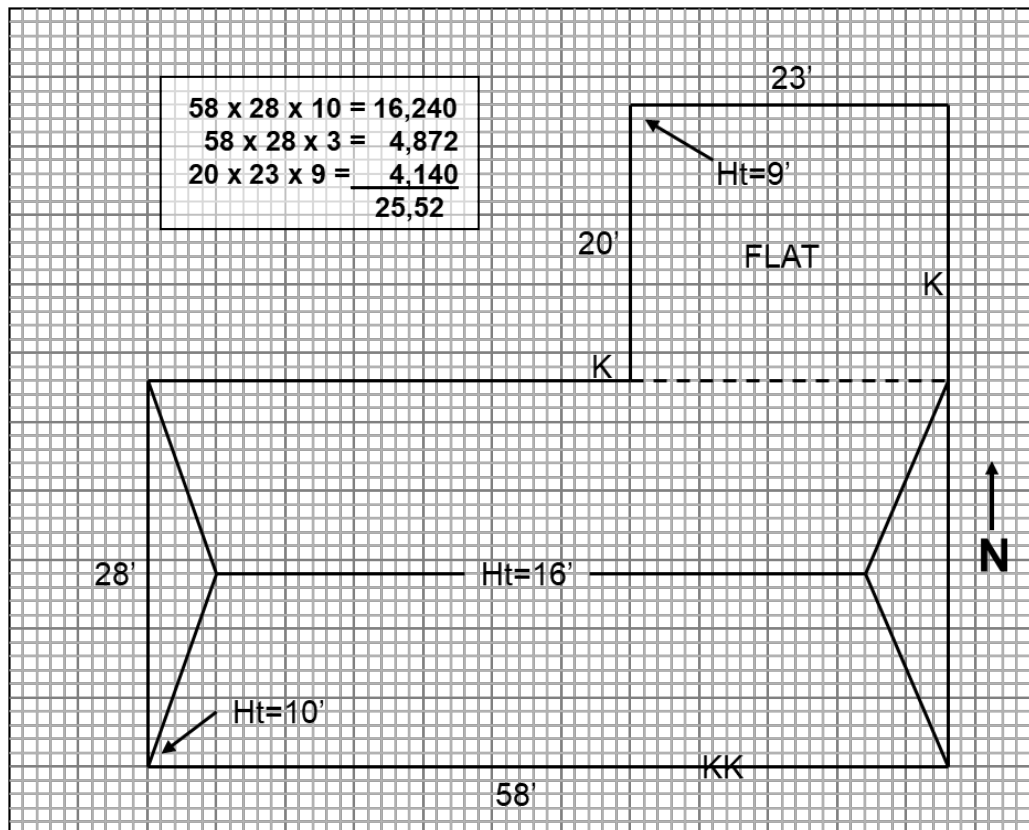
Measurement

For tarped structures, the perimeter of the structure is measured based on where the tarpaulin (“tarp”) will fall using the roof overhang as a guide. A measuring wheel (Figure 9-2A) is a convenient and accurate tool for measuring the perimeter dimensions of a structure. For large, flat-roofed buildings, wheel measurements can be used on the roof. Vertical dimensions can be taken from the ground with a stiff measuring tape, or a laser distance meter (Figure 9-2B). For tall structures, height can be measured by dropping a measuring tape from the roof or by using a laser distance meter.

Structural volume is the product of a building’s length (L), width (W), and average height (H). For a square or rectangular building, the volume is simply $L \times W \times H$, usually expressed in increments of a thousand cubic feet (Mcf). Therefore, the volume of a rectangular, flat-roofed building measuring 75 ft long by 40 ft wide by 12 ft high is $75 \text{ ft} \times 40 \text{ ft} \times 12 \text{ ft} = 36,000 \text{ ft}^3$ or 36 Mcf. For a structure with a typical gabled roof, the average height equals the height to the roofline plus one-half the height from the roof line to the peak (Figure 9-3). For more complex structures, total volume should be measured by dividing the structure into easy-to-calculate sections and then adding the volume of each section together (Figure 9-4).

FUMIGATION INSPECTION GRAPH

Owner's name _____ Occupant _____
 Address _____ City _____ Zip _____
 Home phone _____ Business phone _____ Inspected by _____



ACTIVITY

☒ drywood termites K
☐ powderpost beetles PB
☐ old house borer OHB
☐ subterranean termites X
☐ other: _____

DAMAGE

☐ possible hidden PHD
☐ drywood termite KD
☐ powderpost beetle PBD
☐ fungus F
☐ old house borer OHBD
☐ subterranean termite X

SCALE

☒ 1:1
☐ 2:1
☐ _____

VOLUME

25.8 Mcf

CONSTRUCTION: frame block mobile home other _____ two-story or multi _____

FOUNDATION: slab crawl basement

ROOF: shingle tile slate cedar shake gravel other _____

EXTENUATING CONDITION(S): awning screen enclosure attached fence steep roof deck landscaping other: solar heater

Figure 9-1. Example of a measurement and inspection graph for a structural fumigation. Note: This is not a WDO inspection form. While not required by regulations, by convention, the main entrance of the structure is usually located at the bottom of the graph.



Figure 9-2. A: a measuring wheel allows for quick and accurate measurements from the ground or a flat roof. For tarped structures, measure the perimeter of a structure from where the tarp will drop. B: a laser distance meter is a convenient tool for measuring vertical heights and horizontal distances. (Photos: R. Scheffrahn, R. Borja)

- Keep in Mind -

The fumigation inspection graph should include notations for structural elements that may affect the structure's volume or its sealing and preparation procedures. Examples of these elements include:

- Flat roof.
- Solar panel.
- Dormer windows.
- Exterior windows.
- Basement.
- Screened attached pool/patio enclosure.
- Attached deck.
- Foundation type: slab, crawlspace, or combination.
- Electrical, telephone lines.
- Special roof: steep, high, or parapet.
- Chimney, satellite dish, weathervane, skylight.
- Gas shut-off valve from street service or storage tank.
- "Dry" plumbing drain(s) from structure to seawall or concrete walls.

It is important that the volume of a structure to be fumigated be measured on site and not remotely using tools such as satellite and on-ground images from Google maps or Google Earth. Imaging tools can be useful to see features of the structure to be fumigated and the proximity of adjacent structures, fencing, vegetation, and other features for planning the fumigation, but cannot be relied upon to provide accurate dimensions for measuring volume.

$$\text{Average height} = 10\text{ft} + (8\text{ft} / 2) = 14\text{ft}$$

$$\text{Volume} = \text{Length} \times \text{Width} \times \text{avg Height}$$

$$= 40\text{ft} \times 30\text{ft} \times 14\text{ft}$$

$$= 16,800 \text{ ft}^3 = 16.8 \text{ Mcf}$$

$$\text{Total structure volume} = 16.8 \text{ Mcf}$$

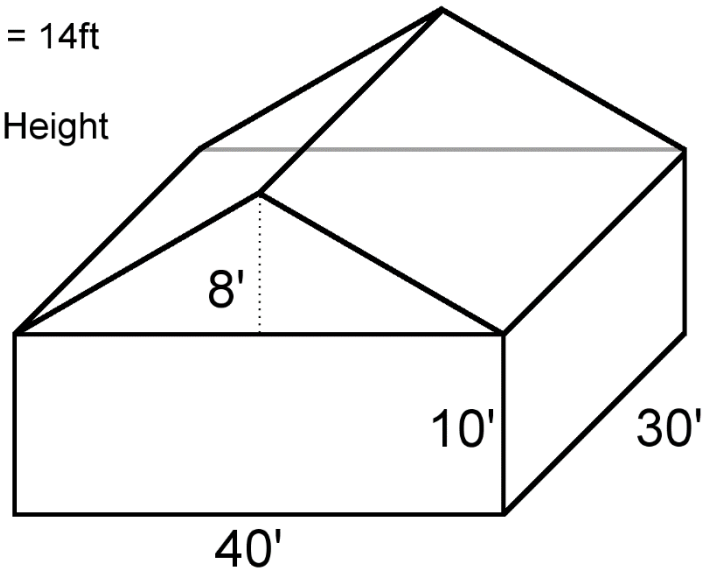
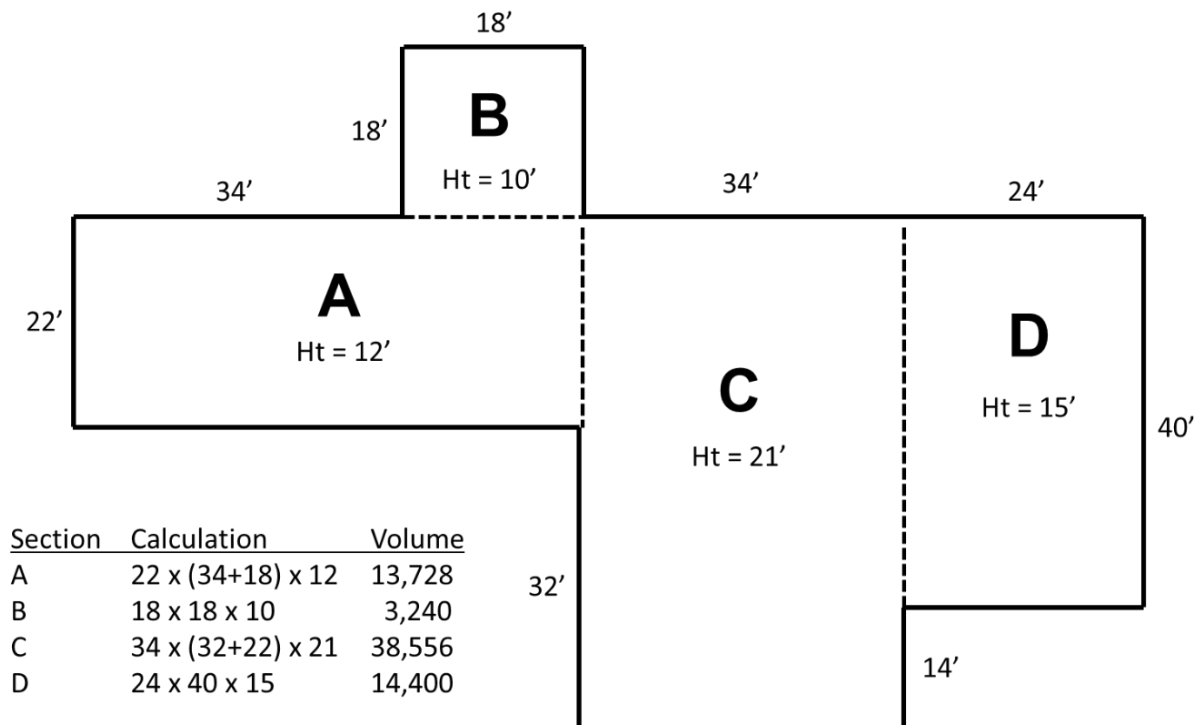


Figure 9-3. Most residences in Florida have some variation of a hip or gable roof. The volume below the roofline can be calculated separately from the volume above the roofline. The roof volume in these structures can be calculated as the area covered by the roof multiplied by half the height of the roofline to the peak.



$$\text{Total Volume} = 69,924 \text{ ft}^3 = 69.9 \text{ Mcf}$$

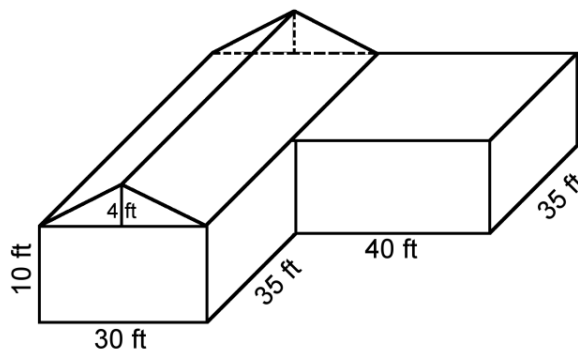
Figure 9-4. Complex structures should be divided into easy-to-measure sections. The volumes of each section can then be added together to provide the total volume.

Review Questions for Chapter 9

59. The Florida Department of Agriculture and Consumer Services (FDACS) requires that pest control personnel who inspect for wood-destroying organisms (WDOs) be trained and supervised by a Certified Operator (CO) for: _____.
- WDO
 - Fumigation
 - Either WDO or fumigation
 - Both WDO and fumigation
60. It is important that the _____ know how to properly measure and calculate the volume of a structure for fumigation.
- Certified Operator for fumigation
 - Special Identification Cardholder
 - Pest control personnel conducting WDO inspections
 - All of the above
61. The roof volume in these structures with hip or gable roofs can be calculated as the area covered by the roof multiplied by half the height of the roofline to the peak.
- True
 - False
62. Which of the following is a tool that should NOT be relied on to accurately measure a structure for fumigation?
- Measuring tape
 - Measuring wheel
 - Imaging tools such as Google Earth
 - Laser distance meter
 - All of the above can be relied on to accurately measure a structure for fumigation

63. Calculate the volume of this structure

- 22,800 ft³
- 26,600 ft³
- 39,200 ft³
- 43,400 ft³
- 56,000 ft³
- 67,200 ft³



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Chapter 10

Sealing

Florida State regulations specify that a structure to be fumigated must be made as gas-tight as is practicable [5E-14.111(7)]. However, it is up to the discretion of the fumigator as to the best method of sealing a structure. This can be done with conventional nylon tarpaulins (“tarps”) with a gas-resistant coating of vinyl, PVC, neoprene or similar material, polyethylene or other plastic film, and/or tape, called “tape-and-seal”. Structures or enclosed spaces that cannot be made reasonably gas-tight by sealing or tenting shall not be fumigated [5E-14.111(7)]. The same types of sealing methods are used for sulfuryl fluoride (SF), methyl bromide (MB), or phosphine (PH). The structure configuration and construction and type of fumigation, such as a quarantine treatment, determine the type of sealing methods used.

When considering any structure as a candidate for fumigation, the inspector should determine if the structure offers sufficient distance along the entire length of the passageway between it and adjacent occupied structure(s) to allow visible inspection for connections, per [5E-14.102(17)], with or without walking between the structure, and for sealing exterior openings for adequate fumigant confinement. A connected structure is defined as any structure physically connected with the structure to be fumigated by construction elements (e.g. pipes, conduits, drains, ducts, etc.), which may allow passage of fumigant between the structures [5E-14.102(17)]. If these requirements cannot be met, the fumigation cannot be performed unless the adjacent structure(s) is vacated [5E-14.111(5)]. The Certified Operator (CO) or Special Identification Cardholder (SPID) must verify these conditions are met before proceeding with sealing, preparing, and fumigating the structure.

Tarpaulin Fumigations

Sealing structures using tarpaulins is often the most effective and efficient method for confining the fumigant. Sealing by tarping may also be required for quarantine fumigations. Considerations when tarping are listed below.

- Sulfuryl fluoride has very low water solubility, so water provides an excellent seal. The SF labeling advise wetting the soil outward from the foundation to the tarp seal if the ground is not sufficiently moist to act as a barrier to the gas. This will help minimize the gas loss through the soil and help to avoid injury to nearby plants via the roots. (Watering the soil in the subarea of crawlspaces before fumigation is **NOT** recommended because the moisture may condense indoor during the fumigation causing water damage and/or odor problems).
- Tarps may be dropped into water when fumigating boats (Figures 10-1A, 10-1B) and other structures over or adjacent to water when using SF.
- After the ground has been smoothened, if necessary (Figure 10-1C), the bottom edges of the tarp are sealed to the ground using materials such as soil, sand, or weighted “snakes” filled with sand or water (Figure 10-1D, 10-1E, 1-1F).



Figure 10-1. A and B: because sulfuryl fluoride is nearly insoluble in water, tarps can be dropped directly into the water. Note the depression on the bow created by the railings in the boat at the left. Provisions for storm runoff were made using a PVC pipe drain leading to a side seam. **C:** raking back gravel so tarps can directly contact the soil for an improved ground seal. **D:** overlapping snakes, **E:** placement of soil and tape at brick curb to seal airspaces between the tarps and the ground seal. **F:** water snakes correctly rolled and clamped, and blocked to prevent rolling, with additional sand snakes. (Photos: Douglas Products, R. Scheffrahn, T. Chouvenec)

- Keep in Mind -

Considerations to minimize SF loss at the “ground seal” (where tarps contact the ground) include:

- Raking back sufficient loose material, such as mulch, gravel, bark chips, pine needles, and debris from the foundation (**Figure 10-1D**).
- Using sand or soil to ramp or tape and adhesives are used to seal gaps around rigid, immovable objects, such as curbs, pavers, and garden edging (**Fig. 10-1E**).
- Providing sufficient tarp “apron” at ground level for the sealing and to accommodate shifting of tarps from wind movement (**Fig. 10-1F**).
- Using sufficiently filled snakes are used for sealing tarps for expected conditions (**Figure 10-1C**).
- Overlapping snakes to minimize fumigant passage between them (**Figure 10-1C**).
- For water snakes, rolling and securely clamping the ends to minimize water leakage during the fumigation exposure period Blocking or securing water snakes to prevent them from rolling off the tarp apron (**Figure 10-1F**).

In addition, a method to prevent sharp structural edges from tearing tarps is to cover these edges with masking tape, carpet sections, corner pads, or similar protective coverings before tarp placement (**Figure 10-2**).



Figure 10-2. A: masking tape, and B:) nylon corner pads can be used to protect tarpaulins from building corners.
(Photos: R. Scheffrahn)

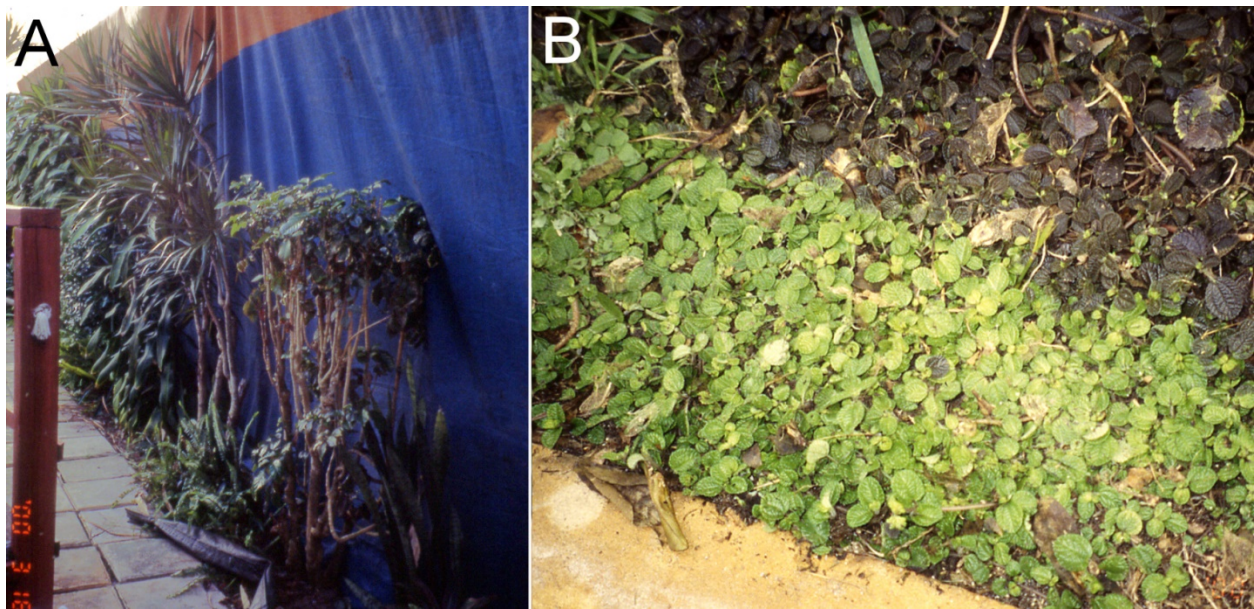


Figure 10-3. A: plants are protected from fumigant damage. B: ground vegetation shows darkening and death of leaves exposed to fumigant. Healthy leaves were outside of the fumigated space. (Photos: R. Scheffrahn)

- Most plants covered by the tarp and fumigated will be burned and lose foliage (**Figure 10-3**). Placing the tarp between plants and structure will reduce plant exposure to the fumigant. If plants must be covered, watering root system can reduce damage and improve the plants chances for recovery.
- Seal exterior conduits that could allow fumigant passage from the tarped space, such as conduits from roof gutters that drain underground. Provisions should be made for water runoff so that water does not accumulate in large volume during a rainstorm (**Figure 10-4**). Parapet walls on roofs, courtyards, and sunken areas in roofing should be fitted with a temporary drainage relief system configured from PVC or garden hose similar.

Figure 10-4. Always account for water drainage of a tarped structure. The courtyard roof of this Florida building filled with water after a heavy rainstorm and collapsed.



- Two tarps are connected by rolling the edges together and securing the roll with clamps. This creates a “hot” seam, where fumigant leakage can occur if the seam may come “undone” in high wind conditions. "Cold" or "false" seams are made where loose seam material is gathered and tightened to ensure that the tarp does not flap in windy conditions (**Figure 10-5C**).

- Keep in Mind -

When possible, a "hot" seam near a keyed entryway allows entry by the fumigator to apply chloropicrin and to later initiate aeration by opening all exterior doors.



Figure 10-5. A: fumigation clamp holding rolled seam joining two tarps. B: transporting clamps on a looped rope. C: right, a "false" seam is used to remove slack; left, a "hot" seam joins two separate tarps. (Photos: R. Scheffrahn)

- Keep in Mind -

Considerations for securing tarps are to prevent them from blowing open in potentially windy conditions include:

- Placing clamps more closely along the seams and/or double clamping (placing clamps directly side-by-side) to reinforce seams.
 - Adding more snakes (e.g., double snaking) on the tarp apron.
 - Placing snakes and/or rolls of tarp over tarps on the roof to prevent these tarps from billowing.
-
- Tarped “stack” fumigations are conducted when materials, such as furnishings, equipment, or commodities, are covered with tarpaulins for fumigation. These fumigations can be conducted outdoors or indoors. When tarped stack fumigations are conducted indoors, the building containing the tarped stack is prepared, posted with warning signs, secured, and aerated as if the entire building is being fumigated (Figure 10-6). For SF residential fumigants, chloropicrin is only introduced into the tarped stack to be fumigated, not the entire building. Indoor tarped stack fumigations could also be considered a type of compartmental fumigation which Florida regulations define as a "spot" fumigation [5E-14.102(7)].



Figure 10-6. This church is a good example of fumigating targeted contents within a larger structure. Only the pews were infested with drywood termites and were tarped and snaked using standard methods (e.g., tarped stack). The church was prepared, posted, secured, and aerated as if the entire church was fumigated. Chloropicrin was only introduced into the fumigated space of the tarped pews. (Photos: R. Scheffrahn)

- Tape-and-seal techniques are often used in combination with tarping to seal tarps to outer fixtures and walls (**Figure 10-7**). Tape-and-seal techniques are discussed below.



Figure 10-7. Multiple layers of tape, reinforced by clamping the tape to the tarp edge, to seal tarps to a block fence connected to a residence. (Photo: Douglas Products)

Tarpaulin Maintenance and Repair

If protected from excessive abrasion, most PVC, neoprene, and vinyl-coated nylon fabric tarpaulins will last for years. There are no specific recommendations for maintaining tarpaulins and cleaning is generally not required. Field patching of small holes and rips can be accomplished using masking, duct, or vinyl adhesive tapes. Repair of larger tears or holes can be accomplished with glue or heat activated patch kits (**Figure 10-8**). Tarpaulins should be replaced when the gas-resistant coating has abraded to the point when adequate fumigant confinement is no longer possible.



Figure 10-8. A heat patching kit can be used at the company site to repair damaged tarpaulins. (Photos: M. Weinberg)

Tape-and-Seal Fumigations

The tape-and-seal method is commonly used to seal large buildings, such as mills, food processing facilities, and warehouses; buildings constructed with walls built of gas-resistant materials, such as concrete, brick, and metal; transportation vehicles such as trains and boats; and temporary chambers such as truck cargo containers and shipping containers. The exception for shipping containers is when tarping is required for quarantine fumigation.

During the tape-and-seal process, various materials, such as polyethylene sheeting, tarps, tape, non-porous panels, and foam sealant, are selectively used to seal doorways, windows, vents, ducts, air handling units, and other gaps where leakage from the fumigated space may occur (Figure 10-9). For large doorways, polyethylene sheeting or tarps can be attached by using overlying furring strips that are secured to the structure with a nail gun or screws (Figure 10-10).



Figure 10-9. For this warehouse fumigation, tarpaulins were used to seal A: large areas like delivery bays, and B: air-handling units. C: using lightweight 4-mil polyethylene sheeting secured with spray adhesive and masking or duct tape for sealing an air handler. D: use of tape to seal gaps around small vents, and E: downspouts. (Photos: R. Scheffrahn)

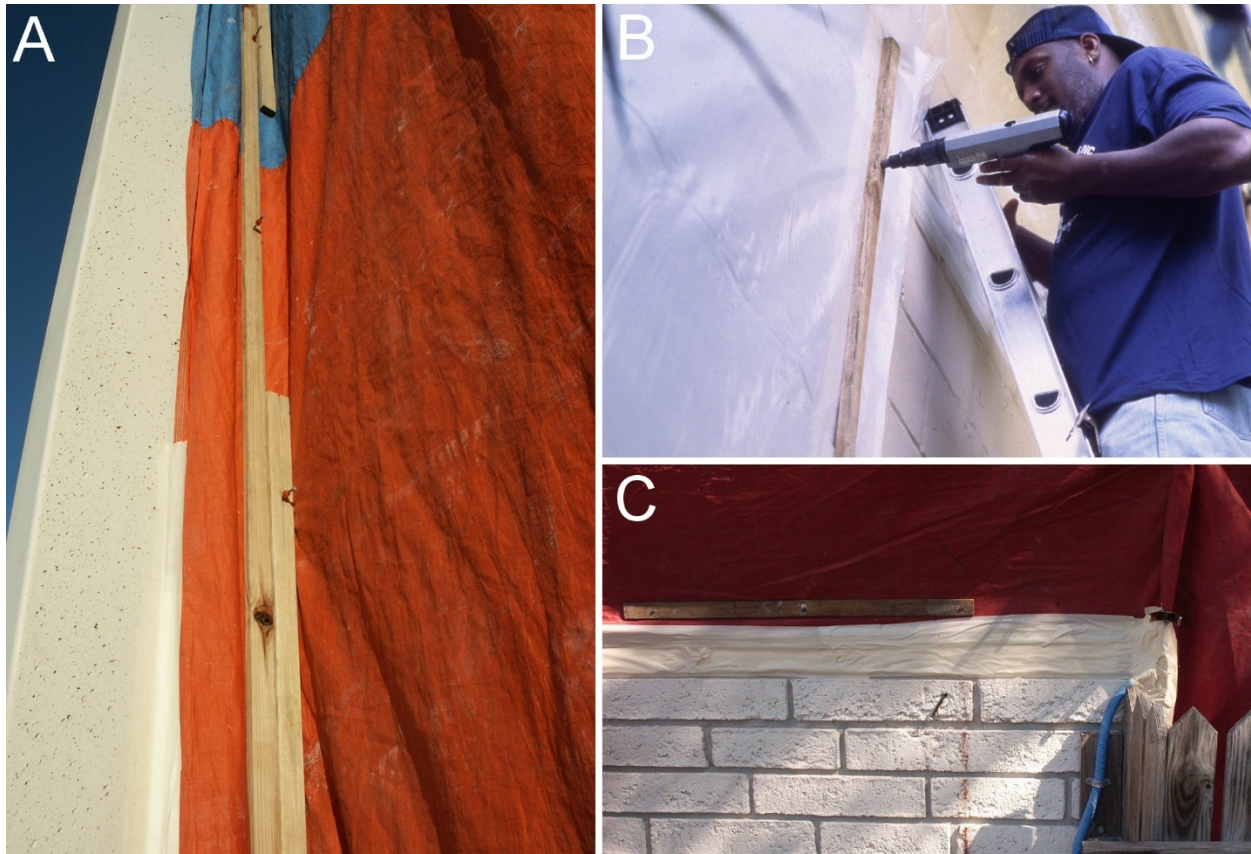


Figure 10-10. A: furring strips were nailed into concrete walls using B: a powered-actuated nail gun to support tarpaulin or 6-mil polyethylene sheeting. C: tape can be used to complete the seal. (Photos: R. Scheffrahn)

- Keep in Mind -

Considerations for selecting and applying tape for sealing:

- Painter's tape can be used to seal painted or finished surfaces in which could be damaged by other types of tape (**Figure 10-11**).
- Since tapes do not adhere well to dirty surfaces, using spray adhesives immediately before applying the tape will enhance adhesion.
- Overlapping tape and applying double- or triple-layers the tape will improve tape adhesion throughout the fumigation period.



Figure 10-11. A and B: four-mil polyethylene sheeting and painter's tape is used for a gas-tight seal on a 153 ft. boat). C: tape-and-sealing fumigation a concrete block storage building. Notice four-mil polyethylene sheeting attached using painter's tape over vents, doors, and eaves to seal the building. (Photos: R. Scheffrahn)

Quarantine Container Fumigations (Methyl Bromide)

Quarantine fumigations are conducted at Florida seaport and airport locations where fresh produce is shipped from foreign sources for sale in domestic markets. All port fumigations use MB because these treatments are effective against a wide range of pests, done quickly (in as little as 2 hours), and non-damaging to the treated commodities. However, in special cases, PH or SF may be used. Agricultural inspectors inspect imported commodity containers to determine if the presence or potential presence of an "actionable" pest requires the entire container be fumigated. Each MB quarantine import fumigation is directed and supervised by a USDA-Animal and Plant Health Inspection Service (APHIS) Plant Protection and Quarantine (PPQ) officer while the fumigation itself is conducted by a private company. The PPQ officer determines the dosage of MB by referring to the PPQ Treatment Manual. The manual provides tables specifying the exposure time and MB concentration based on the type of commodity and temperature. The PPQ officer then determines the amount (dose) of MB to be applied based on the volume of the container.

Quarantine fumigations, usually under refrigeration, are conducted by private contractors located in or near ports of entry. Contractors use their equipment and personnel to handle all technical and mechanical phases of the fumigations while PPQ staff monitors the fumigations. Most PPQ fumigations are conducted in tarpless shipping containers or trailers (Figure 10-12A, 10-12B), tarped containers (Figure 10-12C, 10-12D), or permanently constructed chambers and refrigerators (Figure 10-12E, 10-12F). See subsequent chapters on MB introduction, monitoring, and aeration for pre-shipment, export quarantine, and PPQ-supervised fumigations.



Figure 10-12. Plant Protection and Quarantine fumigations with MB. A: tarpless trailer fumigation in progress and B: tarpless fumigation following aeration. C: tarped shipping container fumigation and D: container fumigation following aeration. E: forty foot PPQ fumigation chamber. F. storage refrigerator after PPQ chamber produce is cleared. (Photos: R. Scheffrahn, Magic Fumigation)

Review Questions for Chapter 10

64. It is the responsibility of the Certified Operator (CO) or Special Identification Cardholder (SPID) to confirm _____ before proceeding with sealing, preparing, and fumigating a structure.
- a. the structure to be fumigated is not physically connected to any adjacent structure by construction elements (e.g., pipes, conduits, drains, ducts, etc.) which may allow passage of fumigant between the structures
 - b. the structure can be sealed to adequately confine the fumigant
 - c. fumigation personnel can walk between the structure to be fumigated and any adjacent structure to conduct sealing and other fumigation activities
 - d. A and B
 - e. All of the above
65. Sealing structures using tarpaulins is often the most effective and efficient method for confining the fumigant.
- a. True
 - b. False
66. The bottom edges of the tarp are sealed to the ground using materials such as:
- a. Soil
 - b. Sand
 - c. Weighted “snakes” filled with sand, rocks, or water
 - d. All of the above
67. A method which will NOT minimize the fumigant loss at the “ground seal” (where tarps contact the ground) is:
- a. Watering soil from foundation to the tarp ground seal
 - b. Placing tarps over mulch, gravel, or bark chips
 - c. Using sand or soil to ramp or tape and adhesives are used to seal gaps around curbs, pavers, and garden edging
 - d. Using overlapping, sufficiently filled snakes
68. A method to reduce plant exposure to the sulfuryl fluoride is:
- a. Placing the tarp between the plant and the structure to be fumigated
 - b. Watering the soil from the foundation to the tarp ground seal
 - c. Placing the tarp over the plant and the structure to be fumigated
 - d. A and B
 - e. B and C

69. Fumigant leakage can occur at a "cold" seam, where loose seam material is gathered and tightened.
- True
 - False
70. A method to secure tarps to prevent them from blowing open in potentially windy conditions is:
- Placing clamps further apart along the seams joining two tarps together
 - Double clamping (placing clamps directly side-by-side) to reinforce seams
 - Adding more snakes (e.g., double snaking) on the tarp apron
 - B and C
 - All of the above
71. When a tarped stack fumigation is conducted indoors:
- The building containing the tarped stack does not need to be prepared, posted with warning signs, secured, and aerated as if the entire building is being fumigated
 - Chloropicrin is introduced in the tarped stack if fumigated using a sulfuryl fluoride residential fumigant
 - Chloropicrin is introduced in the building if the tarped stack is fumigated using a sulfuryl fluoride residential fumigant
 - B and C
 - None of the above
72. The tape-and-seal method is commonly used to seal:
- Large buildings, such as mills, food processing facilities, and warehouses
 - Buildings constructed with walls built of gas-resistant materials, such as concrete, brick, and metal
 - Vehicles, truck cargo containers, and shipping containers
 - In combination with tarping to seal tarps to outer fixtures and walls
 - All of the above
73. Tape adhesion can be improved by treating the surface with a spray adhesive immediately before applying the tape and by applying more than one layer of tape.
- True
 - False
74. For PPQ fumigations, fresh produce is fumigated with:
- Sulfuryl fluoride
 - Phosphine
 - Chloropicrin
 - None of the above

Chapter 11

Interior and Exterior Preparation

Interior Preparation

Interior preparation is best completed before the structure is sealed and secured when lighting and access is much more restricted. The Certified Operator (CO) or Special Identification Cardholder (SPID) must confirm that the following interior preparations have been completed before fumigation using sulfuryl fluoride (SF) residential fumigants. [If any of the directions below apply to the SF commodity fumigant (ProFume®), methyl bromide (MB), or phosphine (PH), it will be noted.]

- All people, domestic animals, pets, and desirable growing plants are removed from the structure before the fumigation begins. [Follow labeling for ProFume, MB, and PH.]

- Keep in Mind -

Considerations if pets, domestic or feral animals are observed or known to occupy areas of the structure to be fumigated:

- The fumigator and property owner should determine whose responsibility it will be to remove, trap, or otherwise exclude these animals from the structure prior to the fumigation.
 - The fumigator can 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.
- Food, feed, drugs (including tobacco products), and medicinals (including those items in refrigerators and freezers) can remain in the structure if they are in plastic, glass, or metal bottles, cans, or jars with the original manufacturer's air-tight seal intact. [All drugs and medicinals must be removed before fumigation with ProFume.]
 - Otherwise, these items are removed from the fumigation site, or double-bagged in nylon polymer bags; Nylofume bags for Vikane® and Nylofume or Fumeguard bags for Zythor®. These nylon polymer bags are available from distributors for SF residential fumigants ([Figure 11-1](#)). When used, these bags should be sealed individually by twisting the top of the bag, folding it once and then securing the fold using tape, rubber band, twist tie, etc.

- Opened items that do not need to be removed or sealed in nylon bags include dental hygiene products (including toothpaste, mouthwash, dental adhesives, and dental whitening products), cosmetics including lipstick, all externally applied lotions and ointments. The labeling for Vikane, not Zythor, does not require removal or sealing of ice and water.



Figure 11-1. Refrigerated food items that are properly double-bagged and sealed with tape (arrow). (Photo: Douglas Products)

- Fish tanks containing live fish are removed, or the fish are removed, or a plan for preparing the tank for fumigation has been followed. This plan can include excluding 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 fumigation, fresh air from outside the fumigated space can be provided to the tank aerator.
- Mattresses (except waterbeds) and pillows completely enveloped in waterproof covers are removed if their waterproof covers cannot be removed or their seal opened. The labeling for Vikane, but not Zythor, allows mattresses and pillows with waterproof coverings containing built-in vents, designed to permit air passage, to remain as-is in the fumigated space; these vents are considered as an open seal.

- Automatic switch controls for appliances and lighting systems that are included in the space to be fumigated are shut off. [Immediately after addition of metallic phosphides to the structure, any lights and unessential electric equipment should be turned off].
- Check for construction elements or connections such as ducting, piping, drainage, or central vacuum system that would allow the fumigant to enter any adjacent structure that is not under fumigation. [Follow labeling for ProFume, MB, and PH.]
- Confirm that electricity is available, as it is required to run fans for fumigant introduction and aeration. If power is disconnected, then alternative sources (such as a portable generator) must be used to supply needed electricity.
- All flames, including pilot lights of furnaces, water heaters, dryers, gas refrigerators, gas logs, ranges, ovens, broilers, open flames, etc. are extinguished. Electrical heating elements such as those in heaters, dryers, pianos, organs, etc. are turned off or unplugged. If the structure has natural gas or propane service, confirm this service has been shut off following procedures required by the local gas company (Figure 11-2). The local gas company or other appropriate authority will need to turn on gas service after it has been turned off to determine that the gas flow and pressure are normal. [Follow labeling for ProFume and MB.]

Figure 11-2. Natural gas and propane leaks can cause disastrous result such as this explosion of a fumigated house in California. (Photo: Orange County Register)



- Confirm you have the keys to the structure and to utility or storage sheds that will be part of the fumigated space. For keyless entries, you will need to temporarily change the code or take other steps to secure the entryway (See below for Exterior Preparation). Florida regulations require that fumigators must have in their possession any keys or an access device necessary to gain the immediate access to a structure, including secondary locking devices, during the entire time that the structure is under fumigation unless a waiver is issued for specialized structures by Florida Department of Agriculture and Consumer Services (FDACS) [\[5E-14.108\(5\)\]](#). [Follow labeling for ProFume, MB, and PH.]
- All 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.) are opened (Figure 11-3). Sealed food items may be left in closed refrigerators and freezers during the fumigation.



Figure 11-3. Cabinets opened in a kitchen. Fan is placed for maximum air circulation. (Photo: Douglas Products)

- Operable windows are open for tarped fumigations. The Vikane labeling permits fumigators to reduce the number of windows that need to be opened during the fumigant exposure period if security may be an issue. For single story structures, at least one operable window in each room, including garages, that contain one or more windows that can be accessed and opened by normal means (e.g., does not require moving furniture, removing nails, or cutting seals such as paint) must be opened. For multi-story structures with shared interior airspace between floors, all windows on the ground level may remain closed. In upper stories, windows are opened as described above for single story structures.
- Sufficient fans are placed in the structure for introduction of the fumigant. Proper introduction fan capacity and placement can prevent a fog-out from occurring during SF introduction (see Chapter 13, Fumigant Introduction). The fumigator cannot control the high temperature or high humidity at the fumigation site which be conducive for a fog-out; however, the fumigator can take other actions to compensate for these conditions and avoid a fog-out. The SF labeling, including ProFume, requires the fumigator to:
 - Place fans for introducing SF in the largest open spaces in the structure where SF will not be applied directly to any surface (**Figure 11-4**).
 - Use fans with a minimum capacity of 1,000 CFM (cubic feet per minute) per pound of SF introduced per minute.

- Place each CP evaporation pan in the airstream of a fan. A minimum of one CP release site is required for every 45,000 ft³ of space to be fumigated. Proper introduction fan placement can ensure that CP thoroughly dissipates during aeration.
- Sufficient fans are placed in the structure for fumigant circulation.
- If the fumigation is to be monitored, monitoring hoses must be placed during preparation (see Chapter 13, Fumigant Introduction, and Chapter 14, Monitoring Fumigant Concentration).

- Keep in Mind -

Considerations for placement of chloropicrin (CP) include:

- At each SF introduction site.
- On each floor of a multi-story structure.
- In areas without excessive furnishings and contents to adsorb CP.
- Use a protective cover in case of spills at CP introduction sites.

Considerations for selection of fumigation fans:

- The fans should be UL listed and grounded. Fans are available with a thermal shut-off switch that automatically turns off the fan motor if it overheats.
- Use fans that have a durable housing to protect the blades, such as metal cage fans, commercial or industrial grade fans, etc.
- Use fans with housing and electric cords intact.

Considerations for placement of circulation fans are:

- To direct air flow into an open attic access. This fan is required to be used during aeration but should be positioned during preparation and operated throughout the fumigant exposure period. This fan should not be used for SF introduction to avoid a possible fog-out in the attic.
- In each compartment or section, such as a tower or steeple, of a compartmentalized building.



Figure 11-4. Chloropicrin pan and SF introduction fan with hose attached and all placed on polyethylene sheeting in a large, open space. (Photos: Douglas Products)

Exterior Preparation

Methods for sealing the structure were reviewed in the Chapter 10, Sealing. The CO or SPID must confirm that all entryways to the structure are posted and secured to conform to the final pre-fumigation inspection requirements [\[5E-14.112\]](#) as follows for SF residential fumigants. All directions below apply to SF residential fumigants. If any of the directions below apply to the ProFume, MB, or PH, it will be noted.

Warning Signs

Warning signs are posted as required. Florida rules are very specific about the appearance, timing, location, and content of warning signs [\[5E-14.112 \(2\)\]](#). [Follow all warning sign directions below for ProFume, MB, and PH.]

- All exterior doors and entrances to the fumigated structure(s) are posted with a warning sign on or at each door or entrance before the release of the fumigant [5E-14.112\(6\)\(7\)\(b\)\]](#).
- In tape-and-seal fumigations, signs must be posted at or on all doors and entrances to the structure or enclosed space, and at least one warning sign on all outdoor sides of the structure or enclosed space not having a door or entrance.
- In tarp fumigations (including commodity fumigations), at least one warning sign must be posted at or on all doors and entrances to the structure or enclosed space and at least one warning sign must be on all sides of the outside of the tarps or sealing covers of the structure, enclosed space, or commodities being fumigated.
- Warning signs must be posted at all doors and entrances to common carriers or enclosed space fumigated and on all gangplanks, ladders, etc. from the dock, pier or land to the vessel being fumigated.

- On multi-unit dwellings, warning signs must be posted at or on all exterior doors or entrance(s) of the structure which, depending on construction, might require sign(s) on all exterior doors or entrances of each individual unit or apartment.
- The warning signs should be visible from any approach to the structure (**Figure 11-5**).



Figure 11-5. Exterior warning signs clamped to the tarpaulin. Selected warning language in Spanish is required. Clamps are a good way to ensure that signs are securely affixed to a structure. (Photos: T. Chouvinc, R. Scheffrahn)

- Warning signs must contain all the information required by regulations [\[5E-14.112 \(3\)\]](#) (**Checklist 11-6**).
- All information displayed on warning signs must be accurate and legible.
- The name and day and night telephone number of the CO in charge of the fumigation, or the CO or SPID who introduced the fumigant must be displayed.
- All emergency phone numbers must be a phone number, cell phone number, or beeper of a person familiar with the job and trained to respond to fumigation emergencies and equipped with label required respiratory protection and gas detection equipment. Answering machines or voice mail systems are prohibited. A 24-hour manned answering service that can immediately contact a CO in charge of SPID who can respond to the emergency is acceptable. [\[5E-14.112 \(5\)\]](#).
- Warning signs must be made of stiff weather-proof material [\[5E-14.112 \(2\)\]](#).
- Warning signs must conform to the following visual requirements [\[5E-14.112 \(4\)\]](#):
 - Be printed in indelible red letters on a white background.
 - The words “DANGER” and “DEADLY POISON” shall be in block lettering at least two inches high.

- The name of the fumigant shall be at least five-eighths inch high.
- The skull and crossbones symbol shall be at least one inch high. All other lettering on the sign must be not less than one-half (1/2) inch high.
- Warning signs posted on the outside of tarps or sealing covers shall not be removed before commencement of aeration and such warning signs posted on or at entrances to the structure (itself), enclosed space or commodities being fumigated shall not be removed until the end of the fumigation period, when aeration has been completed and the premises has been declared safe for re-occupancy [\[5E-14.112 \(6\)\]](#).

- Warning Sign Checklist -

- Fumigating with (accepted common name of fumigant)
- Deadly Poison – All Persons are Warned to Keep Away
- Date and time fumigant was introduced
- Company Name
- Company Business Address
- Certified Operator in Charge
- Fumigant Introduced by
- Emergency Day Telephone
- Emergency Night Telephone
- NOTE: All SF, MB and PH fumigant labels also require the following words be on the warning signs: DANGER/PELIGRO, Area under fumigation, DO NOT ENTER/NO ENTRE, the name of the licensee or his authorized representative, and the name of the property owner or authorized agent.

Checklist 11-6: Information required on warning signs posted on the exterior of the fumigated structure [\[5E-14.112 \(3\)\]](#).

Exterior Entrances

All exterior doors and entrances to the fumigated structure(s), before the release of the fumigant, are locked and secured as required by Florida regulations and fumigant labeling. [Follow labeling for ProFume, MB, and PH.]

- Exterior doors and entrances are secured with a secondary locking device(s) or barred or otherwise secured against entry until the end of the exposure period, then opened for ventilation and relocked, barred or otherwise secured against reentry, including the

reinstallation of the secondary locking device(s), until declared to be safe for reoccupancy by the person exercising direct and personal supervision of the fumigation operation.

- A door or entrance, that, once locked from the interior with a lock that is not accessible from the exterior, does not require a secondary locking device or barricade. [5E-14.112 (7)(b)].
- A secondary locking device is any device, method, or barricade, in addition to existing locking mechanisms, that is demonstratively effective in preventing an exterior door or entrance from being opened or entered by normal means by anyone other than the CO in charge or the SPID [5E-14.102(14)] (**Figure 11-7**). It is necessary to first lock doors with existing mechanisms before using certain secondary locks such as clamshell locks and key excluders.
- Barricade and barring secure the entrances to a structure against unauthorized entry during the fumigation exposure period and must be demonstratively effective in preventing an exterior door or doorway from being opened from the exterior [5E-14.102(15)]. Examples of barricading or barring are interior pins or poles in sliding door tracks (**Figure 11-7D**) or interior sliding dead bolt locks.

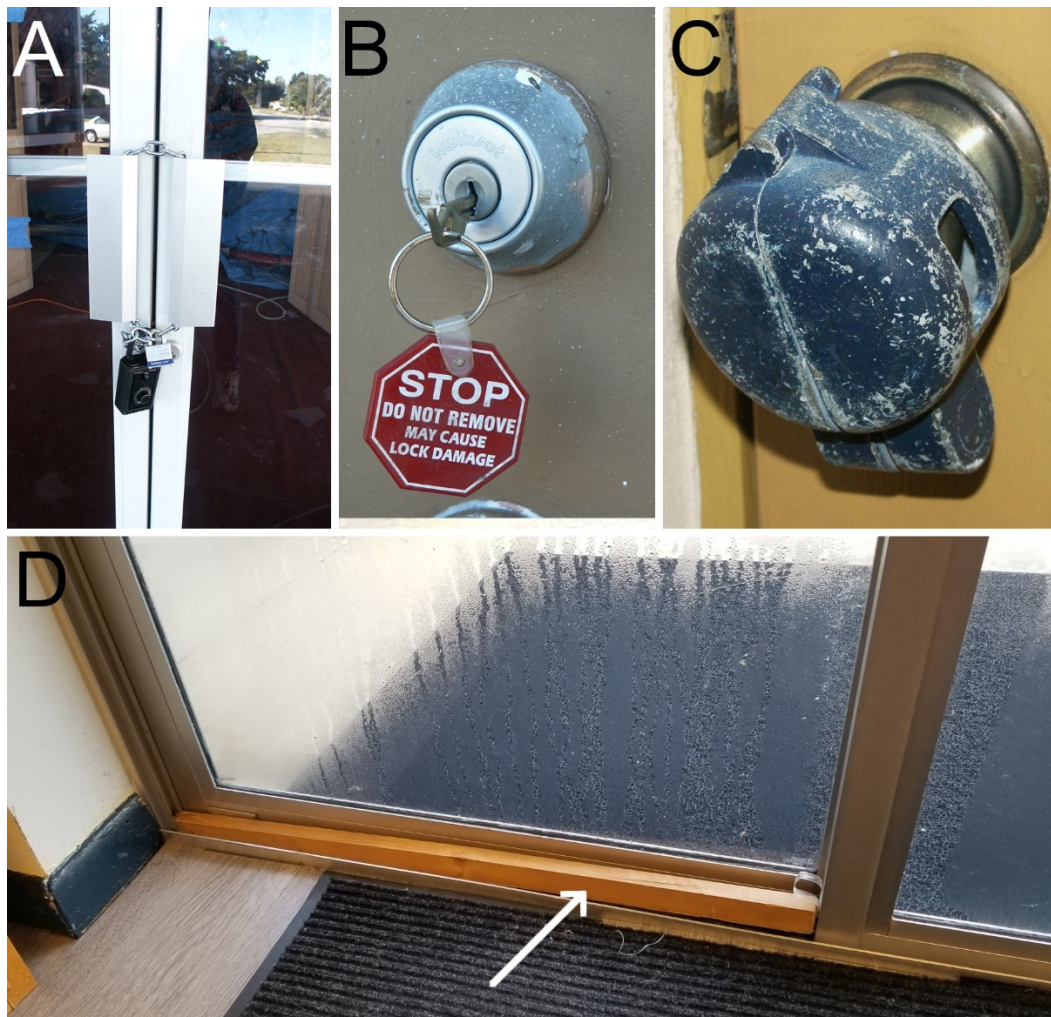


Figure 11-7. Example of secondary locking devices. A: chains with locks, B: key block devices, C: clam-shell key excluders, and D: poles in tracks of sliding glass doors (Photos: R. Scheffrahn, T. Chouvenec)

Note: The Zythor labeling requires the employment of two levels of security against unauthorized entry at each exterior entrance if practicable. In addition to the use of existing locking mechanisms, if present, a secondary locking device must also be used.

- Entrances that do not have existing locking mechanisms or are inoperable must still be secured with a secondary locking device [5E-14.112(7)(c)].
- If multi-unit dwellings with internal stairwells at each floor can be secondarily secured at all ground level entrances, then no other secondary locking devices are necessary, provided that normal requirements [5E-14.112] are met. Multi-unit dwellings with exterior stairwells or fire escapes must be secured or otherwise barricaded or barred to prevent entry from both ground and first floor levels and from any entrance to the structure accessed from the stairwell or fire escape. If neither of these conditions can be met, then all entrances to individual units and all exterior entrances must be secondarily secured [5E-14.112 (7) (d)].

The Vikane label states “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.” This definition permits a wide variety of options for securing entrances, such as recoding keyless entryways with a new, temporary security code that only the CO and SPID have access to during the fumigation.

Special cases

Multi-Unit Structures

When fumigating a single or several unit(s)/room(s) within or connected to a larger structure (such as town houses, apartments, or condominiums), the entire multi-unit structure must be vacated before fumigation [5E 14.111(3)(b)]. The CO or SPID must be present and personally make a careful examination of all parts of the structure to be fumigated, including locked rooms, compartments, and closets, and of structures or enclosed spaces physically joined to or in contact with the structure to be fumigated to verify that no persons have remained therein. SF residential fumigants require that all units of the entire structure must be considered as fumigated, and all required labeling and state regulations must be followed including occupant notification, structure preparation, posting, securing, and aeration. An adult occupant of each currently-occupied unit must be provided with the Fact Sheet for the fumigant. [Follow labeling for all SF fumigants, MB and PH.]

Connected Structures

A connected structure is defined as any structure physically connected with the structure to be fumigated by construction elements (e.g. pipes, conduits, drains, ducts, etc.), which may allow passage of fumigant between the structures [5E-14.102 (17)]. Structures or enclosed spaces which are physically connected with the structure to be fumigated cannot be occupied by persons during

the fumigation period. Fumigators must determine if there is sufficient distance along the entire length of the passageway between the structure(s) to be fumigated and all adjacent occupied structure(s) to allow visible inspection, with or without egress, for connections and for sealing of exterior openings, such as vents, windows, etc., that require sealing for adequate fumigant confinement. If these requirements cannot be met, the fumigation shall not be performed unless the adjacent structure(s) is vacated (see Chapter 10, Sealing) [5E-14.111(5)]. SF residential fumigants require when it is necessary to vacate any connected structure, that structure is considered as a fumigated structure, and all required labeling and state regulations must be followed including occupant notification, structure preparation, posting, securing, and aeration. [Follow labeling for all SF fumigants, MB, and PH.] For SF residential fumigants, CP is introduced only where SF is introduced.

Preparation Considerations for Commodity fumigants

Unlike SF residential fumigants, each commodity fumigant can be used to directly fumigate commodities, food, and feed listed on their labeling. Commodities, food, and feed not listed on the labeling must not be fumigated. One exception is when fumigating buildings, such as mills, food processing facilities, and warehouses, with ProFume, processed food not practical to remove before fumigation may undergo an incidental fumigation with ProFume.

Phosphine may react to cause corrosion in certain metals, such as copper, brass, other copper alloys, gold, and silver, especially at higher temperature and relative humidity (Figure 11-8). Therefore, small electric motors, smoke detectors, brass sprinkler heads, batteries and battery chargers, forklifts, temperature monitoring systems, switching gears, communication devices, computers, calculators, and other electrical equipment should be removed or protected before fumigation. Phosphine will also react with certain metallic salts found in photographic film, some inorganic pigments, etc., so these items should also be removed or protected before fumigation.

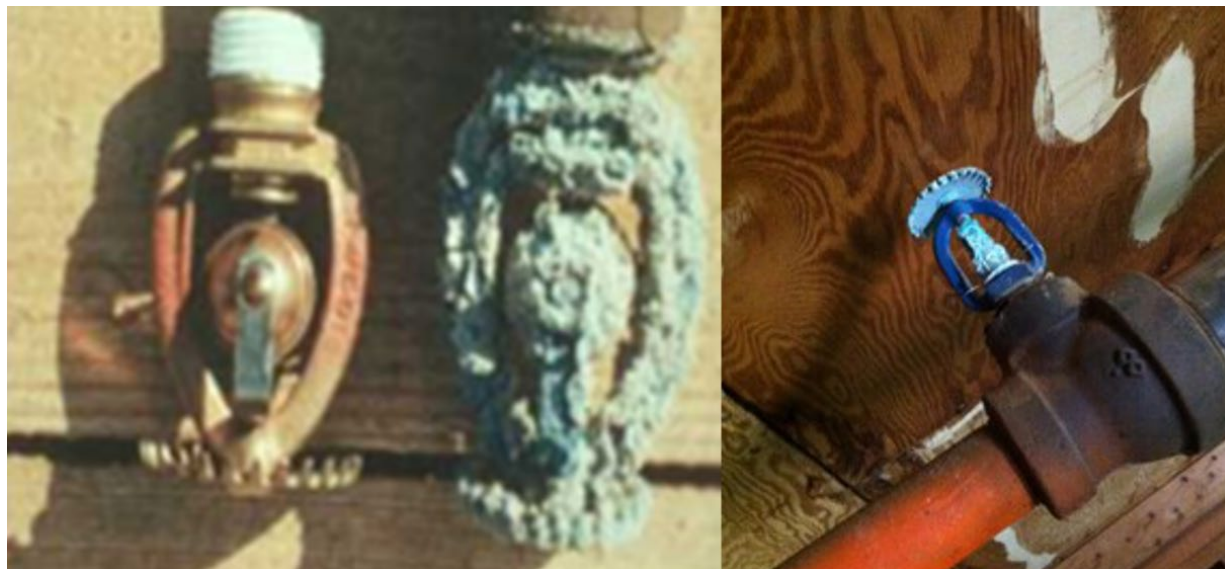


Figure 11-8. Corrosion of copper alloy (brass) fixtures due to high humidity, warm temperatures, and phosphine concentrations above 100 ppm. (Photos: Degesch America, Cardinal Professional Products)

Review Questions for Chapter 11

75. If pets, domestic or feral animals are observed or known to occupy areas of the structure to be fumigated with a sulfuryl fluoride (SF) residential fumigant, the fumigator and property owner should determine whose responsibility it will be to remove, trap or otherwise exclude these animals from the structure before the fumigation.
- True
 - False
76. Which of the following items do NOT need to be removed or double bagged in nylon polymer bags before fumigation using a SF residential fumigant?
- Opened tube of toothpaste
 - Opened plastic soda bottle
 - Eggs
 - An unopened box of cigarettes
 - B and C
 - All of the above
77. Before fumigating using a SF residential fumigant, fish tanks containing live fish:
- Can remain as is because SF has very low water solubility
 - Are removed or the fish are removed
 - Can remain as long as the tank aerator is turned off
 - A and C
78. Before fumigating using a SF residential fumigant, mattresses (except waterbeds) and pillows completely enveloped in waterproof covers:
- Are removed if their waterproof covers cannot be removed
 - Are removed if the seal to the waterproof covers cannot be opened
 - Can remain as is because SF will not penetrate the waterproof covers
 - A and B
79. All flames must be extinguished, and heating elements turned off before fumigating with:
- Sulfuryl fluoride
 - Phosphine
 - Methyl bromide
 - A and B
 - A and C
 - All of the above

80. All 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.) are opened before fumigation using methyl bromide or phosphine.
- True
 - False
81. Florida regulations require fumigators must have in their possession any keys or an access device necessary to gain the immediate access to a structure, including secondary locking devices, during the entire time that the structure is under fumigation.
- True
 - False
82. Which of the following statements is NOT true about placement of warning signs:
- All exterior doors and entrances to the fumigated structure(s) are posted with a warning sign before the release of the fumigant
 - Exterior doors and entrances do not need to be posted with warning signs when the structure is tarped
 - The warning signs should be visible from any approach to the structure
 - B and C
83. Warning signs must contain the:
- Date and time the fumigant was introduced
 - Accepted common name of fumigant
 - Emergency day and night telephone numbers
 - Name of who introduced the fumigant
 - All of the above
84. A secondary locking device is any device, method, or barricade, that is demonstratively effective in preventing an exterior door or entrance from being opened or entered by normal means by anyone other than the Certified Operator in charge or the Special Identification Cardholder.
- True
 - False
85. When fumigating a single unit within a larger structure (such as town houses, apartments, or condominiums), only the units adjacent to the fumigated unit need to be vacated during the fumigation.
- True
 - False

86. SF residential fumigants require when it is necessary to vacate a structure connected to a fumigated structure that:
- a. Occupants in the connected structure must be notified
 - b. The connected structure must be prepared, posted, and secured as if it were fumigated
 - c. Chloropicrin must be introduced in the connected structure
 - d. A and B
 - e. All of the above

Chapter 12

Fumigant Dosage and Dose

The sulfuryl fluoride (SF) calculator applications, the Fumiguide® and Fumicalc®, are required by labeling to be used to determine the amount of SF to apply for SF residential fumigants, Vikane® and Zythor®, respectively. These “apps” are downloaded from Apple, Google, and other app store providers to a device, such as a smart phone or tablet. The following sections on **Dosage** and **Dose** describe inputs and dosing labeling requirements when using these SF calculator applications for SF residential fumigants.

Dosage and Factors Affecting Dosage

The toxicity of SF is determined by two factors: 1) fumigant concentration (C) in ounces/1000 ft³, and 2) exposure time (T) in hours. The equation, $C \text{ (ounces)} \times T \text{ (hours)} = \text{ounce-hour dosage}$, was used to develop the SF calculator applications. The required ounce-hour dosage varies based on the target pest species, the life stage of the pest, and the temperature at the site of the target pest. The toxicity of SF has been evaluated for a wide range of arthropods (insects and related animals such as spiders and ticks). The toxicity of SF is determined by the uptake of the fumigant by the target pest during the exposure period. In general, the more active the arthropod, the faster its respiration rate to inhale the fumigant, and the lower the dosage required to kill it. Adult flies, fleas, and ants are very susceptible to SF, requiring less than half the drywood termite dosage for control.

The non-egg life stages (i.e., larvae, nymphs, pupae, and adults) have always been more susceptible to SF than the eggs for each arthropod species tested. The reason for this is that SF has reduced penetration into arthropod eggs due to it binding to the eggshell and its membranes. The practical implications of higher SF dosages required for egg control depend on the target pest. For social insects, such as drywood termites, control of the egg stage is not necessary when the workers are killed. The immature termites, after hatching from eggs surviving SF exposure, will die without the care of the workers. The standard dosage for SF residential fumigants is based on the drywood termite dosage or “1X” dosage rate (or “Kill Power Index” for Zythor) (Table 12-1). Dosages for other target pests are calculated as a multiple of the drywood termites rate using the SF calculator applications.

For solitary, nonsocial arthropods, a higher SF dosage is required to kill the eggs. The maximum dosage rate of 10X the drywood termite dosage is required to control the eggs of powderpost beetles and deathwatch beetles (Table 12-1). For some insects, such as carpet beetles, the maximum 10X dosage rate is not sufficient to kill the eggs. For these insects, the labeling for SF residential fumigants recommend two fumigations. The second fumigation is conducted after eggs surviving the first fumigation have hatched to kill the larvae that hatched from eggs that survived the first fumigation. The second fumigation should be conducted before the larvae develop into egg-laying adults.

The German cockroach is an exception to other solitary insects because a 1X dosage rate will control the eggs. Unlike other structure-infesting cockroaches, the German cockroach female carries her egg case for about one month, then deposits it about a day before the eggs hatch. Embryos in the egg case are dependent upon the female for survival and will die if the female is killed before the egg case is deposited. A dosage rate above 1X is required to control the egg stage of other cockroach species.

Table 12-1. Dosage depends on the target pest.

Pest	Dosage Factor³ (as a multiple of drywood termite dosage)
Rodents ¹	1/2X
Carpet beetles ² , German cockroaches, and other cockroach species ²	1X
Bed bugs	1.9X or 3X ⁴
Furniture carpet beetles ²	3X
Old house borers and Formosan termites	4X
Clothes moths	6X
Powder post beetles and death watch beetles	10X

¹ To determine the proper dose for rodent control, use 80°F as the calculating temperature.

² More than one fumigation may be needed to control the infestation after egg hatch.

³Dosage Factor = Kill Power Index for Zythor.

⁴Bed bugs dosage for Vikane is 1.9X and for Zythor is 3X.

As temperature decreases, the respiration rates of arthropods decrease, reducing fumigant uptake. Therefore, the SF dosage must be increased as temperature at the site of the target arthropod pest decreases. The dosage for drywood termite must be increased from 72 ounce-hours to nearly 600 ounce hours when temperature decreases from 80°F to 40°F. Drywood termites become immobile at 40°F. Based on this observation, it is impractical to fumigate arthropods below 40°F. Therefore, the labeling for SF fumigants do not permit fumigation when the temperature at the site of the target pest arthropod is below 40°F. The exception to this is when fumigating for rodents. The respiration rate and required SF dosage of rodents are not reduced as the temperature decreases. The temperature used to calculate the dosage for rodents in 80°F (Table 12-1).

- Keep in Mind -

Considerations when measuring the average temperature at the coldest site of the target arthropods:

- The surface slab temperature should be measured for concrete slab foundation structures.
- The soil temperature should be measured for crawlspace foundation structures. The soil temperature below the surface on a shaded side of the foundation or in the crawlspace can be used for dosage calculations.
- An infrared thermometer can rapidly and accurately measure slab and soil temperatures.
- If the structure has both slab and crawlspace foundations, measure the slab and soil temperatures as described above and use the coldest temperature for calculations.
- Indoor ambient temperature settings for air handling systems or outdoor temperatures obtained from weather apps will not provide appropriate temperatures for calculating the dosage.

Dose and Factors Affecting Dose

The dose is the amount of SF residential fumigant introduced into a fumigated space. The dose is determined by:

- The exposure time (T).
- The ounce-hour dosage to be accumulated for the target pest.
- The volume in cubic feet of the fumigated space.
- Fumigant confinement.
- If the fumigation will be monitored.

Exposure time, for calculating the dose, is the time from equilibrium until the initiation of aeration (first opening of the seal). Equilibrium is when the fumigant concentration is equally distributed throughout the fumigated space.

- Keep in Mind -

A recommendation is to assume that equilibrium occurs one hour after fumigant introduction is completed. For example, if fumigant introduction is completed at 2:00 pm on day 1, then equilibrium would one hour later by 3:00 pm. If aeration will be initiated at 11:00 am on day 2, then the exposure time is 20 hours, not 21 hours.

Fumigant confinement is described by half-loss time (HLT) (or “Gas Loss Index” for Zythor), the time for the initial fumigant concentration to be reduced by half. The SF calculator applications use five factors to estimate HLT:

- Tarpaulin condition.
- Seal condition (where a tarp is sealed to the ground, structural and landscape features, hot seams, etc.).
- Wind speed.
- Volume of fumigated space (generally, the larger the volume to be fumigated, the longer the HLT).
- Underseal (concrete for slab or soil type for crawlspace).

The relative effects of changing the values of the five factors on HLT are shown in (Table 12-2).

Table 12-2. The proportional effects of changing the values of five factors on half loss time (HLT) of sulfuryl fluoride.

Factor Value Change	Effect on fumigant Half Loss Time (Confinement) ¹	
Tarp condition improves: Poor → Fair → Medium → Good	Increases confinement	↑
Seal condition improves: Poor → Fair → Medium → Good	Increases confinement	↑
Wind speed increases: 0 → 20 MPH	Decreases confinement	↓↓
Volume increases: 1,000 → 1 million ft ³	Increases confinement	↑↑↑
Underseal improves: Sand → Sandy Loam → Loam → Clay → Slab	Increases confinement	↑↑↑

¹The greater the number of arrows, the greater the impact on the half loss time.

- Keep in Mind -

Considerations when determining values for the five HLT factors:

- Tarpaulin condition and seal condition are qualitative ratings based upon the experience of the fumigator. If the fumigator does not know how to rate these conditions or the building is a tape-and-seal with no tarpaulin used, it is recommended that the fumigation be monitored to determine the actual HLT (see Chapter 14, Monitoring Fumigant Concentration).
- The average forecasted wind speed for the duration of the fumigation can be used for calculating the HLT because the wind speed before the fumigant introduction may change during the fumigant exposure period. A weather app can be used to determine the average wind speed.
- Follow the directions and considerations for measuring a structure to calculate the volume of the space to be fumigated (Chapter 9, Measurement and Fumigation Inspection Graph).
- If a structure contains both slab and crawlspace foundations, the underseal condition should be based upon the soil type in the crawlspace because the fumigant will follow the path of least resistance to continuously leak through the crawlspace underseal. In this situation, the slab should be used as the underseal rating only if the crawlspace is very small relative to that of the slab, or if the slab is partitioned as a separate fumigation space from the crawlspace for fumigation.

When a fumigant leaks from a confined space, it does not do so in a proportional or linear manner. When half 50% of the fumigant has leaked out in a given time, then after the same time period, only 25% of the original amount of fumigant leaves, then 12.5% the original amount, and so on. Therefore, when half of the fumigant has leaked out at time X, then only a quarter of the fumigant will leak out during the next time X, and so on. This non-proportional decline in fumigant concentration over time is shown in [Table 12-3](#), for a fumigation with an 8-hour HLT and initial SF concentration of 24 oz/1000 ft³. Half-loss calculations are complex and require the use of the SF calculator applications to estimate the HLT.

To obtain an actual HLT, SF concentrations within the fumigated space must be measured (e.g., “**Monitored**”) at two or more timed intervals during the fumigation period. These measurements are entered into the SF calculator applications to determine the actual HLT (see Chapter 14, Monitoring Fumigant Concentration). The fumigator must indicate in the SF calculator application if the fumigation will be monitored or nonmonitored to determine the dose of SF to introduce into the structure. The dosage of a non-monitored fumigation is **33% more** than that of a monitored fumigation. The higher dosage for a non-monitored fumigation compensates for possible errors in estimating the HLT and weighing SF during introduction. A monitored fumigation will determine if the initial SF concentration and actual HLT are sufficient to accumulate the required dosage. If not, corrective actions can be taken, such as checking and

correcting leaks in the seal to improve HLT, adding more fumigant, and/or increasing exposure time.

Relative humidity and fan amperage have **no effect** on the dosage and dose of SF. These factors affect the **rate** (pounds/minute) at which SF is introduced to avoid a fog-out (see Chapter 13, Fumigant Introduction, on cause and prevention of a fog-out).

Table 12-3. Percent reduction in sulfuryl fluoride concentration in fumigated space every eight hours.¹

Starting Sulfuryl Fluoride Concentration (oz/1,000 ft ³)	Hours after Equilibrium	Ending Sulfuryl Fluoride Concentration (oz/1,000 ft ³)	Reduction from Initial Sulfuryl Fluoride Concentration (oz/1,000 ft ³)
24	8	12	50%
12	16	6	25%
6	24	3	12%

¹ 8-hour half loss time (HLT)

Warning Agent Chloropicrin (CP) Dose

The CP dose to apply is calculated based on the application rate of **one ounce CP per 10,000-15,000 ft³** or the dose rate calculated by the SF calculator applications. The Vikane Fumiguide calculator app includes a model that uses the volume of the fumigated space, underseal (slab or soil), and exposure time to determine the lowest dose of CP that can be applied.

Dosage for Other Fumigants

The SF commodity fumigant (ProFume®) uses a Windows-based Fumiguide program, for Windows based computers, to calculate the dosage and dose. As with the SF residential fumigants, the required ounce-hour dosage varies based on target pest species, the life stage of the pest, and the temperature at the site of the target pest. Nonetheless, the ProFume Fumiguide program differs from the previously described SF calculator applications as follows:

- The maximum ounce-hour dosage cannot exceed **1500 ounce hours**. This restriction prevents the concentration of fluoride residues in fumigated food commodities from exceeding the maximum fluoride concentrations, called tolerances, permitted by the US Environmental Protection Agency (EPA). These trace fluoride residues are permanent, and form when SF interacts with proteins and fats in food and cannot be distinguished from naturally-occurring fluoride residues in food.
- The fumigator can select a dosage range based on the degree of control needed, from low to high, and type of fumigation, building, or commodity.

The ProFume Fumiguide program calculates the dose using the same factors as the previously described SF calculator applications with the following difference. Because most ProFume fumigations are monitored, a non-monitored dosage and estimated HLT are not calculated. The fumigator enters an estimated HLT based on experience or previous records.

Metallic phosphide labeling provide tables listing the concentration of fumigant to apply based on the commodity to be fumigated and the exposure time based on temperature. Aluminum phosphide normally requires a minimum exposure time of 48 hours for pellets and 72 hours for tablets. The required exposure period can extend to 8-10 days at 41-53°F. Magnesium phosphide requires a minimum exposure time of 24 hours for plates and strip formulations. Fumigation with metallic phosphides cannot occur if the temperature is below 40°F.

The longer exposure times for metallic phosphides, compared to those for SF and MB, are due to the time required for phosphine gas to evolve from metallic phosphides reacting with moisture. In addition, longer exposure of insects to PH, even at low concentrations, produces greater toxicity than shorter exposures to high concentrations. Research has shown that irreversible injury to insects does not occur to a wide range of phosphine concentrations until a minimum exposure period has elapsed; only after this exposure period does the mortality for a given species become constant for a CT dosage.

Review Questions for Chapter 11

87. The toxicity of SF is determined by two factors:
- Temperature and relative humidity
 - Target pest and its life stage
 - Fumigant concentration and exposure time
 - All of the above
88. The required ounce-hour dosage of sulfuryl fluoride varies based on target pest species, the life stage of the pest, and the relative humidity at the site of the target pest.
- True
 - False
89. The _____ are more susceptible to sulfuryl fluoride than the eggs for each arthropod species tested.
- Larvae
 - Nymphs
 - Pupae
 - Adults
 - All of the above
90. The standard dosage for sulfuryl fluoride residential fumigants is based on a "1X" dosage rate (or "Kill Power Index" for Zythor) for control of _____.
- Drywood termites
 - Bed bugs
 - Powder post beetles
 - All of the above
91. For solitary, nonsocial arthropods, a higher sulfuryl fluoride dosage is required to kill the _____.
- Larvae
 - Eggs
 - Pupae
 - Adults
92. The maximum 10X dosage rate will control all life stages of dermestid beetles.
- True
 - False

93. As temperature at the site of the arthropod pest decreases:
- The respiration rate of arthropods increases
 - Arthropods increase their intake of sulfuryl fluoride
 - The dosage for sulfuryl fluoride increases
 - All of the above
 - None of the above
94. The labels for sulfuryl fluoride fumigants do not permit fumigation when the temperature at the site of the target pest arthropod is below:
- 30°F
 - 40°F
 - 50°F
 - There is no temperature limit on the labeling
95. When fumigating a building with a slab underseal, the temperature for dosage calculation should be determined:
- By using the outdoor temperature based on a weather app
 - Based on the temperature setting for the indoor air handling system
 - By measuring the indoor slab temperature using a surface or laser thermometer
 - B and C
 - All of the above
96. The dose for a sulfuryl fluoride residential fumigant is:
- The amount of fumigant introduced into the fumigated space
 - The concentration of the fumigant at equilibrium
 - The concentration of the fumigant multiplied by the hours of exposure
 - None of the above
97. Which of the following does NOT determine the dose of a sulfuryl fluoride residential fumigant?
- Exposure time,
 - Ounce-hour dosage to be accumulated,
 - Relative humidity
 - If the fumigation will be monitored.
 - Fumigant confinement (half loss time)
 - C and D

98. Exposure time, for calculating the dose, is the time from:
- Fumigant introduction until the initiation of aeration
 - Fumigant equilibrium until the initiation of aeration
 - Fumigant introduction until active aeration is completed
 - Fumigant equilibrium until active aeration is completed
99. Fumigant confinement, also called half-loss time (HLT) or “Gas Loss Index” for Zythor, is the time:
- Required to achieve the required ounce-hour dosage
 - For the fumigant to aerate
 - For the initial fumigant concentration to be reduced by half
 - None of the above
100. Which of the following factors is NOT used to estimate half loss time for sulfuryl fluoride residential fumigants?
- Tarpaulin condition
 - Volume of the fumigated space
 - Underseal
 - Relative humidity
 - C and D
101. The dosage of a non-monitored fumigation is _____ more than that of a monitored fumigation.
- 33%
 - 50%
 - 100%
 - None of the above
102. Relative humidity and fan amperage effect both the dosage and dose of sulfuryl fluoride.
- True
 - False
103. The chloropicrin dose to apply is calculated based on the application rate of one ounce of chloropicrin per _____ or the dose rate calculated by the sulfuryl fluoride calculator apps.
- 10,000 – 15,000 ft³
 - 20,000 – 40,000 ft³
 - 45,000 ft³
 - None of the above

104. The Vikane® Fumiguide® Calculator App can be used to calculate the dosage and dose for all sulfuryl fluoride fumigants, including ProFume®.
- a. True
 - b. False
105. To restrict the increase in concentration of fluoride in food commodities fumigated using ProFume, the maximum dosage of ProFume cannot exceed:
- a. 10x dosage rate
 - b. 1000 ounce-hours
 - c. 1500 ounce-hours
 - d. None of the above
106. The longer exposure times for metallic phosphides, compared to those for sulfuryl fluoride (SF) and methyl bromide (MB), are because:
- a. Phosphine requires additional time to penetrate the insect cuticle to kill the insect
 - b. Phosphine does not diffuse as rapidly in air compared to other fumigants
 - c. Of the time for metallic phosphides to react with moisture to produce phosphine
 - d. All of the above

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Chapter 13

Fumigant Introduction

Introduction of the warning agent chloropicrin (CP) for sulfuryl fluoride (SF) residential fumigants and the fumigant is a critical phase because it marks the beginning of an airborne hazard within the fumigated space. Florida rules [\[5E-14.108\(2\)\]](#) and labeling for SF, methyl bromide (MB), and phosphine (PH) require two persons trained in the use of the fumigant be present during fumigant introduction.

Final Pre-Application Inspection

Before a warning agent or fumigant is applied, the Certified Operator (CO) or Special Identification Cardholder (SPID) must make a final, personal inspection of the structure to ensure that the structure is properly prepared for fumigation. The final inspection must be conducted immediately before the fumigant is applied and must ensure the following [\[5E-14.112\(1\)\]](#):

- All preparations for fumigation as directed by the labeling are completed.
- No unauthorized person is present within the structure or enclosed space to be fumigated or in any adjacent structures or spaces that are required to be vacated for the fumigation. Within these spaces, all locked rooms, compartments, and closets must also be inspected [\[5E-14.111\(4\)\]](#).
- All open fires, flames, pilot lights, and electrical heating elements are turned off.
- Inspections for multi-unit dwellings have additional requirements as follows [\[5E-14.112\(1\)\(d\)\]](#):
 - The CO or SPID must conduct a thorough, systematic inspection of each room in every unit to ensure that all provisions specified in above bullet points have been completed.
 - Then, exterior doors and/or entrances of each inspected unit must be secured against unauthorized re-entry while preparations and inspection of other units or areas of the structure are completed. This may require the temporary use of secondary locks on entrances that are to be left unattended between the time of inspection and the introduction of the fumigant.
 - Any individual unit that cannot be safely secured while other areas are prepared must be re-inspected immediately before the fumigant is applied.

It is important to complete this inspection before releasing CP. Chloropicrin is not effective in vacating pets, domestic animals, or feral animals. Considerations for excluding these animals from the fumigated space are reviewed in Chapter 11, Preparation.

Chloropicrin Application

Chloropicrin is used as a warning agent only with SF residential fumigants, Vikane® and Zythor®. It is not used as a warning agent with commodity fumigants. There are exceptions when CP is not required for use with SF residential fumigants as follows:

Exceptions for Vikane: When fumigating passenger railcars and permanent and temporary fumigation chambers, such as shipping containers, storage pods, trailers, and trucks:

- A thorough walk-through inspection must be performed of each railcar/chamber with doors being locked immediately upon leaving.
- For railcars, a guard must be posted during fumigant introduction, exposure period, and aeration.
- A guard is not required for permanent and temporary fumigation chambers, if locking device(s) or barricade(s) are installed that are demonstratively effective in preventing the fumigated space from being entered 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.

Exceptions for Zythor: When fumigating passenger railcars and shipping containers, all of the above inspection requirements (as for Vikane) are conducted and a guard must be continuously posted for these sites during the period between introduction and final clearance.

The personal protective equipment for applying CP (reviewed in Chapter 5, Safety) are summarized in (Table 13-1). The following labeling requirements must be followed for application of CP:

- Chloropicrin must be applied by persons certified to apply SF residential fumigants or be under their supervision on site. The Vikane labeling also requires a second person trained in the use of CP be available on site.
- Chloropicrin must be released within the structure at least **5 to 10 minutes before SF introduction**.
- The CP evaporation container, containing the wicking agent (e.g., cotton), must not be made of magnesium, aluminum, or their alloys as chloropicrin may be severely corrosive to such metals (Figure 13-1).
- Apply no more than **3 fluid ounces of CP per evaporation container**. Use a measuring device to measure the calculated volume of chloropicrin to apply.
- Do not apply liquid CP directly to soil, concrete, or wood in the fumigated space. Odor from CP desorbing from these surfaces after direct application can be persistent and difficult to remove and stains will result.

- When applying CP at multiple CP introduction sites within a structure, start at the point farthest from the exit and work toward the exit.
- Additional requirements and considerations for fans, and placement and number of CP introduction sites release sites were reviewed in Chapter 11, Preparation.

Table 13-1. Personal protective equipment (PPE) required for introduction of chloropicrin warning agent and sulfuranyl fluoride (SF) residential fumigants.¹

PPE	Required (Yes or No) or Prohibited PPE During Application	
	Chloropicrin	SF Residential Fumigant
Goggles	Prohibited	Yes
Safety glasses	Yes	No
Full Face Shield	Yes	Yes
Chemically resistant gloves	Yes	Prohibited
Long sleeved shirt ²	Yes	No
Long Pants ²	Yes	No
SCBA	Yes if one applicator is applying at more than two sites in a structure	No, but two SCBA must be on site per [5E-14.108(6)]

¹ SF Residential Fumigants are Vikane® and Zythor®.

² Long sleeved shirt and long pants required when applying ProFume® (SF commodity fumigant).



Figure 13-1. Graduated container with lid, evaporation pan, and chloropicrin bottle. (Photo: R. Scheffrahn)

- Keep in Mind -

A consideration for CP introduction is to use a CP measuring device with a graduated scale for fluid ounces and a reclosable cap (Figure 13-1). An advantage of using these devices is that CP can be measured outside the structure so only the amount of CP needed during the fumigation is carried into the structure.

Self-Contained Breathing Apparatus (SCBA) requirements

Florida rules require that two SCBAs [5E-14.108(6)] and two persons trained in the use of the fumigant and SCBA [5E-14.108 (2)] must be present during fumigant introduction. One of these trained persons must be the CO or SPID; the other is a CO, SPID, or identification cardholder with a Fumigation Identification Card endorsement on the employee identification card (FID) (see Chapter 5, Safety).

Sulfuryl fluoride fumigant application (includes SF Residential Fumigants and ProFume®)

Sulfuryl fluoride is packaged as a liquid in a compressed gas cylinder (see Chapter 4, Fumigant Physical Properties, Formulation, Packaging). A dip tube extends from the bottom of the cylinder to the valve, which is opened to release liquid SF through an introduction hose (Figure 13-2). When properly introduced, SF remains as a liquid in the introduction hose and instantly expands to form a gas upon release from the hose (Figure 13-3A). Sulfuryl fluoride extracts heat from the surrounding air to provide the energy needed for it to expand from a liquid to a gas. As a result, the air where SF is released is chilled, which can cause a cloud of condensed water (fog) to form. If excessive fog forms, called a “fog-out,” it can condense on sensitive surfaces and damage may occur (Figure 13-3B).

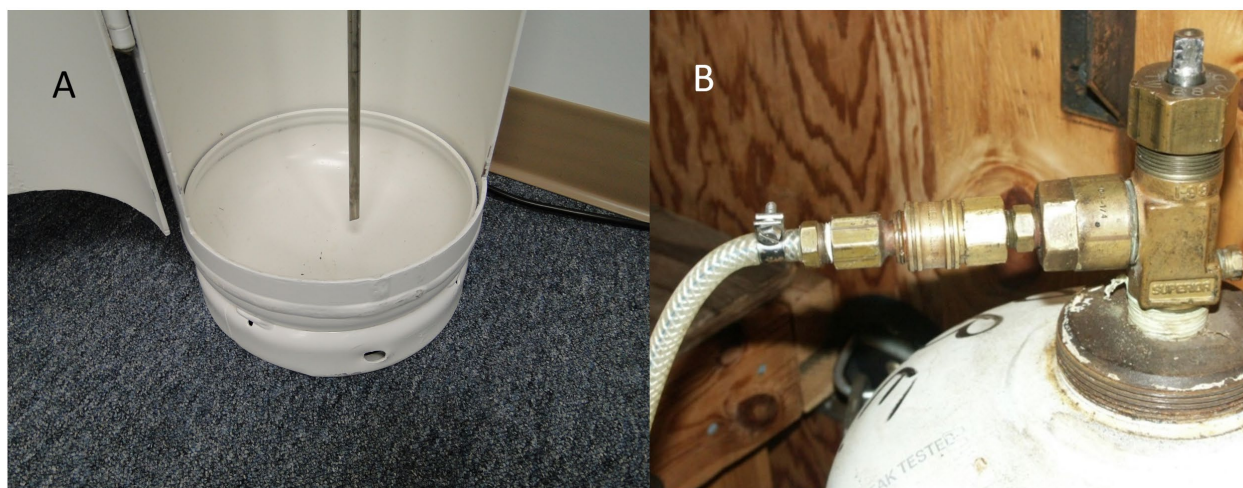


Figure 13-2. A: dip tube near bottom of SF cylinder B: hose clamp and hose adapter assembly and (Photos: R. Scheffrahn)

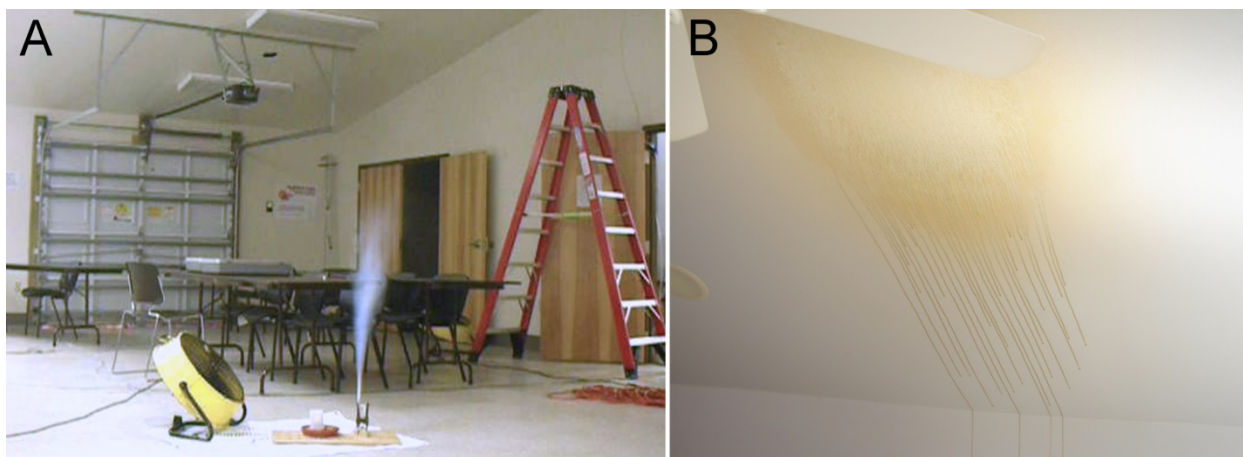


Figure 13-3. A: If high concentration of SF is rapidly introduced in high humidity conditions, a plume of water vapor forms by SF turning to gas during release in humid air (fog-out). **B:** stained ceiling caused by SF vapor plume as the result of inadequate fan capacity. (Photos: R. Scheffrahn)

The amount of fog formed, and its rate of dissipation depend upon the SF release rate, temperature and relative humidity, and introduction fan capacity, quantity, and placement. Fumigators do not control the release rate of SF by partially opening the cylinder valve. The cylinder valve is fully open during SF release (see Additional SF Application Requirements below). Also, fumigators cannot easily control temperature and humidity in the fumigated space. Fumigators can prevent fog-outs by controlling the following three factors:

- Volume of room where SF is released.
- Air exchange rate (introduction fans).
- Introduction rate.

The location of SF introduction sites and introduction fans are reviewed in Chapter 11, Preparation. The SF introduction rate is controlled by the inner diameter (ID) and length of the introduction hose, which are discussed below.

SF Introduction Hose

Introduction hose properties for SF:

- Should be compatible with SF.
- Must have a **minimum burst pressure of 500 pounds per square inch (psi)**.
- Have an appropriate diameter and length to control the SF introduction rate so fan capacity is not exceeded. Sulfuryl fluoride is introduced into the blast of air from one or more fans having a total capacity of at least 1000 cu ft per minute (cfm) for each pound of SF released per minute. Reducing the inside diameter (ID) of the introduction hose slows the SF introduction rate (Table 13-2). Lengthening the hose also slows the SF introduction rate (Table 13-3). Using of a 1/8 inch ID introduction hose of about 100 feet in length will provide a SF introduction rate for drywood termite fumigations that will not exceed the capacity of most standard industry fans.

- Is secured to the introduction fan, to an introduction stand, or by other means to avoid damaging surfaces, furnishings, and other structural features. Introduction hoses should not be attached to customer furnishings or structural features such as doorknobs to avoid damaging surfaces of these items by clamping, taping, or contact with liquid SF.

Table 13-2. Effect of inside diameter (ID) size on introduction rate of sulfuryl fluoride (SF) through a 25 ft polyethylene Hose at 65°F.

Hose ID in Inches	Pounds of SF per minute
1/8	4
1/4	20
1/2	45

Table 13-3. Effect of hose Length (1/8 inch ID) on introduction rate of sulfuryl fluoride (SF) at 65°F.

Hose Length in Feet	Pounds of SF per Minute
25	4
50	2.8
100	2

Preventing Fog-Outs

The possibility of fog-out ([Figure 13-3](#)) occurring is greater in high humidity conditions when a high SF concentration is applied, such as for high dosage fumigations (e.g., 10X), short exposure times, and reduced half loss times. In these situations, fog-outs can be prevented by:

- Reducing the amount of SF introduced into one area by having more than one introduction site.
- Monitoring the fumigation to reduce the SF dose and initial SF concentration.
- Extending the exposure period to reduce the SF dose and initial SF concentration.
- Using an introduction hose longer than 100 ft if the SF introduction rate, as determined by the SF calculator app, is less than 2 pounds/minute (see [Table 13-3](#)).
- Using two fans at each SF introduction site if the capacity of each single fan is inadequate.
- Using a combination of the above techniques.

Additional SF Application Requirements

The personal protective equipment required for applying SF (reviewed in Chapter 5, Safety) is summarized above in [Table 13-1](#). The following labeling requirements must be followed for application of SF:

- The cylinder is placed outside of the structure to be fumigated.
- The pounds of SF introduced are measured using a weighing scale, such as hanging or flatbed scale ([Figure 13-4](#)).
- If a hanging scale is used, a hanging bonnet or similar device designed for this purpose is used to hang the cylinder from the scale. Never suspend the SF cylinder by the valve.
- Initially, the cylinder valve should be opened slightly, about $\frac{1}{4}$ turn, until flow has begun to check for leaks, and then opened about one full turn which should give full flow through the fumigant introduction hose.
- Partially opening the cylinder valve to control the rate of SF introduction should not be done as it can freeze and damage valve components, the introduction hose, and hose connectors.
- The final 3-5 pounds of SF in a cylinder are in a gas phase, will move through the introduction hose very slowly compared to liquid SF, and therefore will take longer to introduce.



Figure 13-4. A: the fumigator is weighing an SF cylinder fitted with a hanging bonnet hooked to a hanging scale and is wearing a full face shield for eye protection. **B:** the fumigator is weighing a SF cylinder on top of a flatbed scale during fumigant introduction, is wearing safety goggles for eye protection. No gloves are worn. (Photos: T. Chouvenec, R. Scheffrahn)

Methyl bromide Application

When applying MB for quarantine and pre-shipment fumigations (e.g., trucks, vans, trailers, or shipping containers), the end of the introduction hose should be anchored inside an evaporation pan unless a heat exchanger is used. Due to the high boiling point of MB, a heat exchanger ensures rapid and complete volatilization of MB to a gas upon release into the fumigated space. A heat exchanger will heat the liquid MB to at least 150°F, by passing the MB through coils submerged in a hot radiator fluid bath (**Figure 13-5**).

The personal protective equipment for applying MB was reviewed in Chapter 5, Safety. The following labeling requirements must be followed for application of MB:

- The cylinder is placed outside of the structure to be fumigated.
- The amount of MB introduced is measured.
- A fan or blower is used to aid in even distribution of MB.

For MB quarantine fumigations, the placement and number of introduction hoses and fans are specified in the [USDA APHIS quarantine treatment manual](#).



Figure 13-5. Methyl bromide is introduced into a commodity container for quarantine treatment. A 100-lb. cylinder of MB is resting on a flatbed scale that has been adjusted to read the desired weight loss. Methyl bromide flows from the open valve into a heat exchanger (upper right) that converts the liquid into a hot gas exiting through the heat resistant red shooting hose. Note that the fumigator is wearing a full face shield, long-sleeve shirt, long pants, shoes, and socks, while gloves are not worn. (Photo: R. Scheffrahn)

Phosphine Application

The personal protective equipment for applying PH was reviewed in Chapter 5, Safety. Metallic phosphide pellets and tablets can be applied by numerous methods depending upon the fumigation site and commodity, as follows:

- Mixed with a bulk commodity while the commodity is loaded into storage structures or transportation vehicles, such as railcars and ships.
- Applied to the commodity surface.
- Applied shallow or deep within the commodity using a hollow tube, called “probing.”
- Laid in single layers on sheets or trays of Kraft paper or foil (e.g., in warehouses).

If dust-free applications are required, such as for processed foods, metallic phosphides pellets and tablets can be placed in gas permeable “sleeves,” applied as pre-packaged doses, or applied in other formulations such as strips or plates. During application, metallic phosphide pellets and tablets should not be stacked or piled up, and metallic phosphide formulations should not be contacted by liquid water.

Pellets and tablets come packaged in sealed metal flasks that are full when new and free of excess moisture. A fire hazard exists when a flask of pellets or tablets is only partially used at one time and then re-sealed. Re-opening the flask for a subsequent use in the future could result in a “flash” of flame at the opening of the canister. Label directions advise fumigators to always open canisters outdoors or in a ventilated area with the canister pointing away from the body.

Review Questions for Chapter 13

107. Before a warning agent or fumigant is applied, the _____ must make a final, personal inspection of the structure to ensure that the structure is properly prepared for fumigation.
- Certified Operator (CO)
 - Special Identification Cardholder (SPID)
 - Employee Identification Cardholders with the Fumigation Identification Card endorsement (FID)
 - A and B
 - All of the above
108. Which of the following is not true regarding what the fumigator must check while conducting the final inspection before fumigant introduction?
- All preparations for fumigation as directed by the labeling are completed
 - People are vacated from the space to be fumigated, including connected structures that are required to be vacated for the fumigation
 - Locked rooms, compartments, and closets do not need to be inspected
 - All open fires, flames, pilot lights, and electrical heating elements are turned off
109. In multi-unit dwellings, any individual unit(s) that cannot be safely secured while other areas are prepared must be re-inspected immediately before the fumigant is to be applied.
- True
 - False
110. Chloropicrin is effective in vacating pets, domestic animals, or feral animals from a structure before introducing sulfuryl fluoride.
- True
 - False
111. Chloropicrin is released at least _____ minutes before sulfuryl fluoride is release.
- 15
 - 10
 - 5
 - B and C
 - There is no time requirement

112. Apply no more than _____ fluid ounce(s) of chloropicrin per evaporation container.
- One
 - Two
 - Three
 - Four
113. When applying chloropicrin at multiple introduction sites within a structure, which of the following statements is true?
- The applicator must wear an SCBA when applying at two introduction sites
 - The applicator must begin application at sites closest to the exit
 - The applicator must wear chemically resistant gloves, long sleeved shirt, long pants, and goggles
 - The applicator must wear an SCBA when applying at more than two introduction sites
 - C and D
114. Fumigators can prevent a fog-out during introduction of sulfuryl fluoride by:
- Selecting a small, confined space to introduce the fumigant
 - Only partially opening the cylinder valve to slow the introduction rate of the fumigant
 - Using an introduction hose that is 1/4-inch ID and 100 feet in length
 - All of the above
 - None of the above
115. Hoses used to introduce sulfuryl fluoride must have a minimum burst pressure of _____ pounds per square inch (psi).
- 200
 - 300
 - 400
 - 500
 - There is no minimum requirement for hose burst pressure
116. To prevent a fog-out from occurring in high humidity conditions when a high sulfuryl fluoride concentration is applied, the fumigator can:
- Have more than one introduction site for sulfuryl fluoride
 - Use two fans at each sulfuryl fluoride release site
 - Use a shorter introduction hose
 - A and B
 - All of the above

117. Cylinders of sulfuryl fluoride and methyl bromide are placed outside of the structure to be fumigated during introduction of these fumigants.
- a. True
 - b. False
118. Metallic phosphide pellets and tablets can be applied:
- a. By stacking and piling
 - b. By probing into or applying to the commodity surface
 - c. Directly to processed foods
 - d. All of the above
 - e. None of the above

Chapter 14

Monitoring Fumigant Concentrations

Two types of measurements of fumigant concentrations, called monitoring, occur during and after fumigant introduction into the fumigated space.

- Monitoring fumigant concentrations inside the fumigated space is conducted to determine if the necessary dosage is being accumulated to control the target pests(s).
- Monitoring fumigant concentrations outside the fumigated structure is conducted for industrial hygiene to prevent workers and bystanders from being exposed to fumigant concentrations above those permitted by the labeling.

Monitoring Fumigant Concentrations for Dosage Confirmation

Monitoring fumigant concentrations in the fumigated space is the only way to confirm that the necessary dosage is accumulated to control the target pest. This monitoring greatly reduces the potential for failure to control the target pest, which may require subsequent retreatment. Monitoring to confirm dosage accumulation is not mandatory by Florida rules or by labeling for sulfuryl fluoride (SF), methyl bromide (MB), or phosphine (PH). Monitoring is mandatory when:

- Conducting quarantine fumigations. The [USDA APHIS quarantine treatment manual](#) specifies monitoring intervals and minimum concentrations of MB, SF, or PH when these fumigants are used for quarantine treatments.
- Required in the fumigation contract.

- Keep in Mind -

Monitoring to confirm dosage accumulation is recommended for fumigations that are:

- Tape-and-seal, because the SF calculator apps are less accurate for estimating half-loss time for this type of sealing.
- Costly to redo, such as large buildings (e.g., multi-unit dwellings, schools, hotels, etc.) and/or 10X dosages.

The fumigator does not enter the fumigated space to monitor fumigant concentrations for dosage confirmation. Before fumigant introduction, one or more monitoring hoses are placed in the space to be fumigated to draw air samples during the fumigant exposure time. The USDA APHIS quarantine treatment manual specifies the number and location of monitoring hoses for quarantine treatments. For non-quarantine fumigations, the number and location of monitoring hoses are chosen by the fumigator.

- Keep in Mind -

For non-quarantine fumigations, fumigators should consider placing the monitoring hose(s) to sample air in:

- The airspace(s) most representative of the air space of the structure, such as the living space of a residential building.
- Multiple locations in large buildings.
- Separate sections of a partitioned structure, such as each floor of a multistory building.

Placement of the ends of the monitoring hoses to connect to the monitor will depend upon the type of high concentration monitor used; manual or remote. Manual monitors require the fumigator to be on-site to take readings directly from the monitor. Examples of these manual monitors for SF include the Fumiscope® (Figure 14-1A) (Key Chemical and Equipment Co.) and SF-ReportIR® (Figure 14-1B) (Spectros Instruments). The Fumiscope can also be used to measure MB concentrations. Monitoring hoses must terminate outside of the fumigated space to be connected to a manual monitor.



Figure 14-1. A: Fumiscope (Key Chemical and Equipment Co.) used to measure high concentrations (greater than 0.5 oz/1000 ft³) of sulfuryl fluoride or methyl bromide. B: SF-ReportIR (Spectros Instruments) used to measure high concentrations (greater than 0.1 oz/1000 ft³) of sulfuryl fluoride. (Photos: Key Chemical and Equipment Co, Spectros Instruments)

Remote monitors have data transmission capabilities and do not require the fumigator to be on-site to take readings. These monitors can measure fumigant concentrations in multiple locations within the fumigated space and communicate readings by cellular or satellite transmission to a host computer. The fumigator can view these readings on a smart phone, computer, or similar device. Examples of these remote monitors for SF include the RDA Fumiscope (Figure 14-2A), (Key Chemical and Equipment Co.) and Spectros SF400 (Figure 14-2B), (Spectros Instruments). The monitoring hoses are connected to the remote monitor, which can be located inside or outside of the fumigated space. These monitors require that one hose be placed outside the fumigated space so the monitor can automatically be re-zeroed using fresh air.

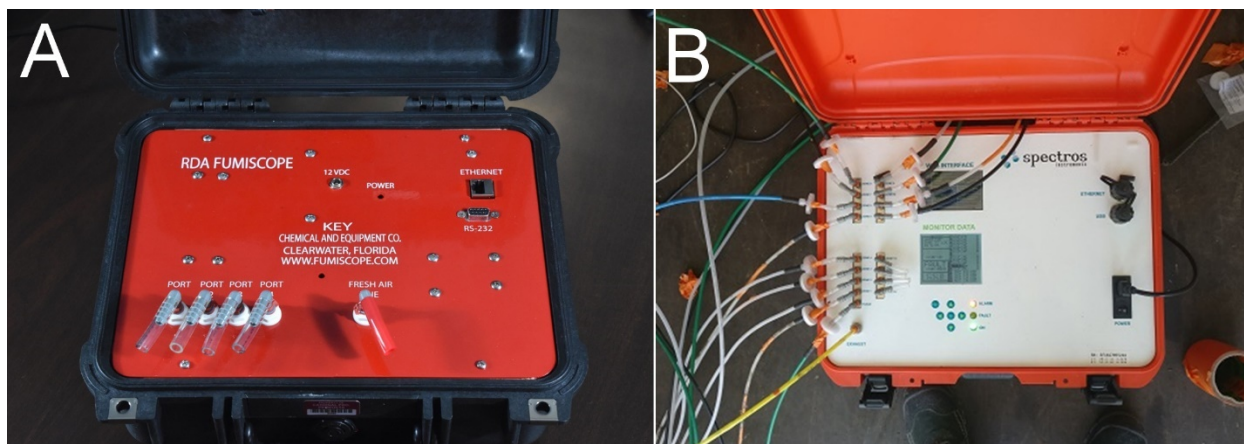


Figure 14-2. A: the RDA (Remote Data Acquisition) Fumiscope (Key Chemical and Equipment Co.) used to remotely measure high concentrations (greater than 0.5 oz/1000 ft³) of sulfuryl fluoride. B: SF400 (Spectros Instruments) used to remotely measure high concentrations (greater than 0.1 oz/1000 ft³) of sulfuryl fluoride. (Photos: Key Chemical and Equipment Company, Douglas Products)

- Keep in Mind -

When using the calculator apps for Vikane®, Zythor®, or ProFume® program to calculate accumulated dosage and actual half loss time (HLT), the following should be considered for monitoring intervals:

- Two monitoring readings, taken at equilibrium and before aeration, are needed to calculate the total accumulated dosage.
- An additional monitoring reading taken after equilibrium will allow calculation of the actual HLT to determine if additional time and/or SF are needed to obtain the necessary dosage. The time required between the two measurements to calculate the actual HLT should be sufficient to detect a change in the fumigant concentration. Usually two to four hours will be adequate, but in the case of structures with very good confinement, more time may be necessary between readings.

The USDA APHIS quarantine treatment manual specifies the time intervals for monitoring, the minimum concentration readings, and if additional fumigant must be added to obtain the required dosage for quarantine fumigations. For non-quarantine fumigations, time intervals for monitoring are at the discretion of the fumigator.

Remote monitors have programs that calculate accumulated dosages using a different formula than those used by the SF calculator apps and program. This can result in the remote monitor calculating an accumulated dosage that is greater than that calculated by the SF calculator apps or program. Labeling for SF only acknowledges using the SF calculator apps or program, and not the remote monitor programs, to calculate the accumulated dosage. Therefore, concentration readings from remote monitors should be hand-entered into the SF calculator apps or program to determine if the necessary accumulated dosage has been obtained.

On-site monitoring can be conducted by one person and does not require that two trained persons and two SCBA be present. If monitoring indicates that reentry into the fumigated space is required or that additional fumigant needs to be introduced, two SCBA [\[5E-14.108\(6\)\]](#) and two persons trained in the use of the fumigant and SCBA [\[5E-14.108\(2\)\]](#) must be present during these activities. One of these trained persons must be the Certified Operator (CO) or Special Identification Cardholder (SPID); the other is a CO, SPID, or identification cardholder with a Fumigation Identification Card endorsement on the employee identification card (FID) (see Chapter 5, Safety).

A number of high concentration monitors are available for MB and PH. Procedures for proper operation, maintenance, and service for each monitor are available from its manufacturer and should be followed to optimize performance for measuring fumigant concentrations.

Monitoring Fumigant Concentrations for Industrial Hygiene

Monitoring fumigant concentrations outside the fumigated structure during the fumigant introduction and/or exposure period, and during fumigant aeration is required for commodity fumigants: SF (ProFume®), MB, and PH. This monitoring is conducted using low concentration detectors (see Chapter 6, Fumigant Low Concentration) to confirm that workers and bystanders are not exposed to fumigant concentrations above those permitted by the labeling. The high concentration SF monitors previously discussed do not detect SF at sufficiently low concentrations (e.g., 1 ppm), and therefore cannot be used for industrial hygiene monitoring.

Industrial hygiene monitoring is conducted to determine areas to exclude unprotected personnel, or if respiratory protection is required for fumigators working near the fumigated enclosure. Only the labeling for MB, and not those for PH or SF, requires a buffer zone be established around the fumigated enclosure (see Chapter 5, Safety). The MB labeling has specific requirements and directions for conducting industrial hygiene monitoring to determine if the buffer zone is sufficient, and what type of respiratory protection is required for fumigation workers inside the buffer zone. Recording these monitoring readings is required for MB and is commonly done for SF and PH as part of the Fumigation Management Plan (FMP, see Chapter 8, Fumigation Notification and Documentation).

Review Questions for Chapter 14

119. Monitoring fumigant concentrations in the fumigated space is the only way to confirm the necessary dosage is accumulated to control the target pest(s).
- True
 - False
120. Monitoring to confirm dosage accumulation is mandatory for sulfuryl fluoride, methyl bromide, or phosphine:
- By the labeling directions for the fumigant
 - By Florida rules
 - When conducting a quarantine fumigation
 - All of the above
121. It is recommended to monitor to confirm dosage accumulation for a fumigation that is:
- For control of powder post beetles
 - For control of bed bugs
 - A tape-and-seal fumigation
 - B and C
 - All of the above
122. Fumigators should consider placing the monitoring hose(s) to sample air, to confirm dosage accumulation, in the following location(s):
- In every room of a building
 - On each floor of a multistory building
 - Where the target pest(s) are known to infest
 - All of the above
 - None of the above
123. An example of a high concentration fumigant monitor is:
- SF-ReportIR
 - SF-ExplorIR
 - Interscan
 - CLIRcheck
124. A remote high concentration fumigant monitor:
- Can measure fumigant concentrations in multiple locations in the fumigated space
 - Can communicate fumigant concentration readings by cellular or satellite transmission to a host computer
 - Enables the fumigator to view fumigant concentration readings remotely on a smart phone, computer, or similar device
 - All of the above

125. When using the SF calculator apps for Vikane® or Zythor® or ProFume® program, monitoring readings to determine the total accumulated dosage should be taken at:
- a. Equilibrium, 2-4 hours after equilibrium, and before aeration
 - b. Equilibrium and 2-4 hours after equilibrium
 - c. Equilibrium and before aeration
 - d. None of the above
126. An example of a remote high concentration fumigant monitor is:
- a. SF400
 - b. Fumiscope
 - c. Fumispec Lo
 - d. A and B
 - e. All of the above
127. The labeling for SF fumigants permits the use of remote monitor programs to calculate the accumulated dosage.
- a. True
 - b. False
128. Monitoring fumigant concentrations outside the fumigated structure during the fumigant introduction and/or exposure period, and during fumigant aeration is NOT required for:
- a. ProFume®
 - b. Methyl bromide
 - c. Phosphine
 - d. Vikane® and Zythor®

Chapter 15

Aeration and Clearance Testing

Aeration is the process by which the fumigant dissipates from voids and desorbs from contents and commodities in the fumigated space. The time for aeration depends upon numerous factors, including the fumigant and its applied concentration, rate of air exchange, and the materials stored within the fumigated space. These factors are discussed in more detail below.

General Aeration Requirements

Florida rules require that two SCBA [\[5E-14.108\(6\)\]](#) and two persons trained in the use of the fumigant and SCBA [\[5E-14.108 \(2\)\]](#) must be present from the start of aeration (first opening of the seal) until the active aeration period with all operable doors and windows open, if required by the fumigant labeling, is completed and the structure is secured for the remaining aeration period. One of these trained persons must be the Certified Operator (CO) or Special Identification Cardholder (SPID); the other is a CO, SPID, or identification cardholder with a Fumigation Identification Card endorsement on the employee identification card (FID) (see Chapter 5, Safety).

Sulfuryl Fluoride (SF) Residential Fumigants (Vikane® and Zythor®)

These fumigants have Aeration Procedures 1 and 2 with step-by-step requirements as follows:

- An initial “active” aeration period must be conducted for a minimum of 1 hour, with all operable windows and doors open, aided by the use of one or more fans. Total fan capacity, using one or more fans, should be at least 5,000 cfm. The fans used for SF introduction and circulation can be used for aeration. This active aeration efficiently ventilates SF from air spaces within the structure.
- Following the active aeration, the structure remains posted and is secured again for a designated time period beginning from the start of aeration (i.e., first opening of the seal). During this “passive” aeration period, ventilation is not required, windows can be closed, and the secondary locks and barricades are reinstalled. The passive aeration allows additional time for SF to dissipate from voids and desorb from mattresses, furniture, insulation, and other structure contents.
- The total aeration time (from first opening of the seal and until the structure is tested for SF clearance) depends on the initial concentration of SF:
 - Minimum 6 hours aeration for 16 oz SF/Mcf or less.
 - Minimum 8 hours aeration for more than 16 oz SF/Mcf.

The first opening of the seal occurs when the seal is broken (first tarp seam or tape seal is opened, or the first ground snake is removed) (Figure 15-1A). Then, all operable windows and doors must be open (Figure 15-1B). Tarps and seals are removed during the initial part of Aeration Procedures 1 and 2 for SF to properly aerate during the active and passive aeration phases.

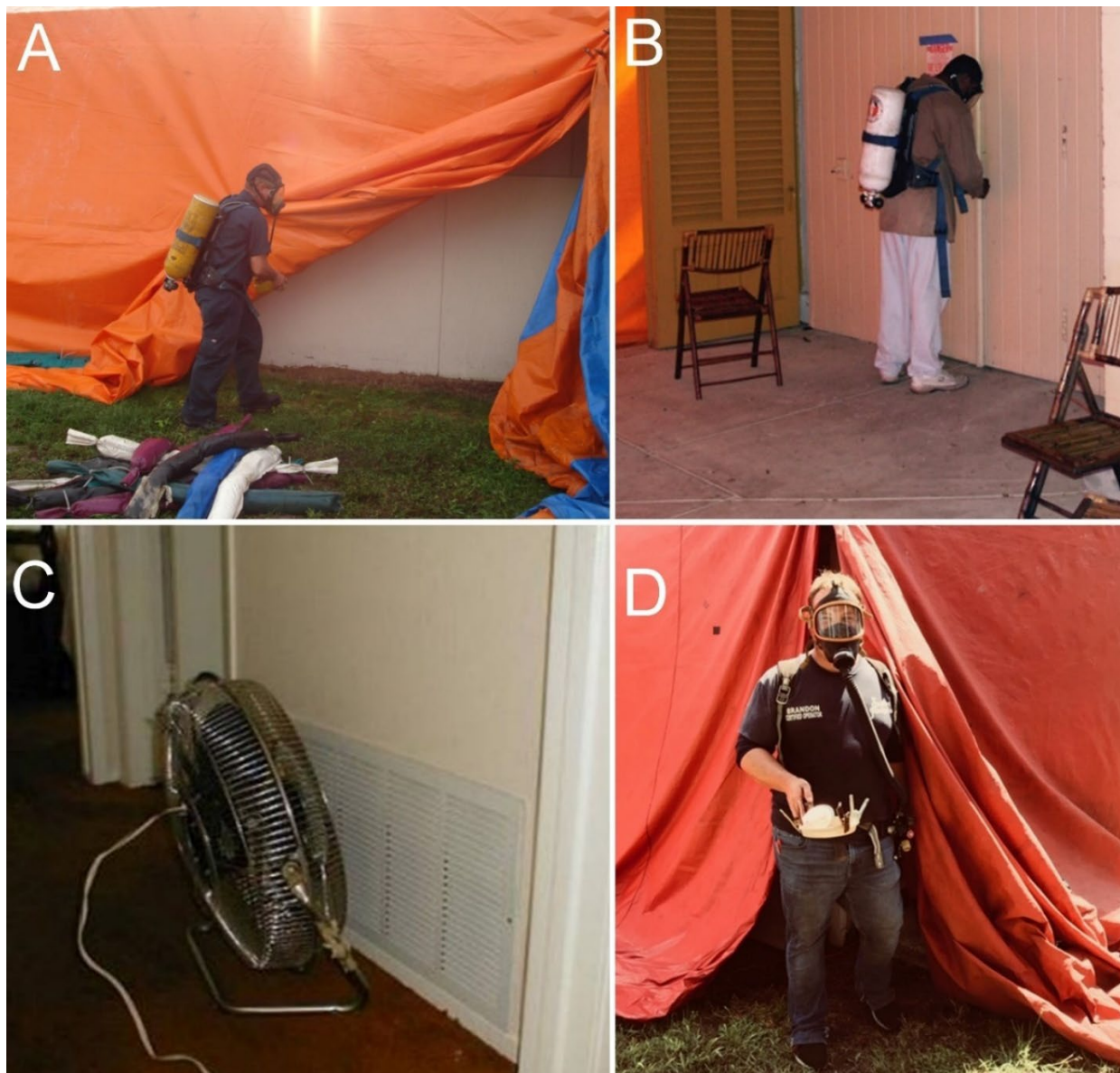


Figure 15-1. A: aeration Procedures 1 and 2 for SF residential fumigants require an active aeration that begins when all operable doors and windows are opened. In this photo, the fumigator is wearing a SCBA to enter the tarped structure, to B: begin opening all operable external doors. C: fan blowing air into a ventilation duct. D: removal of the chloropicrin evaporation containers at the beginning of the aeration period. (Photos: R. Scheffrahn, Douglas Products)

The following actions are also be conducted during Aeration Procedures 1 and 2:

- Opening all operable attic doors and accesses and directing a fan into the attic. These actions can be done during preparation. Directing a fan, at a 45° angle into an attic opening, aides in fumigant distribution during the fumigant introduction, exposure period, and aeration. If the structure has an attached garage, the door between the garage and structure should be open.
- If the structure has a central air handling system, the fan (or blower) should be activated, without turning on the cooling compressor, for each unit if operational. As an alternative, a fan may be placed in front of a furnace inlet to blow air into the central heating and cooling ducts (Figure 15-1C).
- Removal of all chloropicrin (CP) evaporation containers from the fumigated space during the active aeration may aid in the dissipation of the warning agent from the structure (Figure 15-1D). Chloropicrin evaporates within 1 hour after application (see Chapter 4, Fumigant Physical Properties, Fomulation, Packaging. Therefore, the fumigator does not need to wear chemically resistant gloves, long sleeved shirt, or long pants when removing the CP evaporation containers during aeration.

The Vikane labeling also has another set of Aeration Procedures 1 and 2 that are specific for passenger railcars. Aeration Procedure 1 is used if the on-board railcar ventilation systems are not operable and requires aerating the railcar for a minimum of 6 hours. Aeration Procedure 2 is used if the on-board railcar ventilation systems are operable and requires actively ventilating the railcar for a minimum of 2 hours.

Commodity Fumigants

Due to the diversity and complexity of structure types fumigated using commodity fumigants (including PPQ) using SF (ProFume®), metallic phosphides (PH), or methyl bromide quarantine gas (MB Q), there is no step-by-step aeration procedures, contrary to SF residential fumigants. Instead, the fumigator plans the aeration procedure and equipment needed for each fumigation as part of the Fumigation Management Plan (FMP), relying on experience and records from previous fumigations of the same or similar structures (see Chapter 8, Fumigation Notification and Documentation). General practices to aerate commodity fumigants include venting fumigant away from workers and bystanders, aerating at the highest point practical, directing aeration gases upward, and controlling the exhaust rate. Often, structures that process and store commodities have air handling systems that can be activated to vent fumigant during the aeration process.

Commodity fumigants do have some specific aeration requirements when aerating commodities to ensure the fumigant has sufficiently desorbed from the commodity before the fumigator releases it to the customer. The aeration requirements vary based the fumigant, the commodity, and the type of commodity bulk packaging. The aeration requirements can include minimum aeration times and use of fans during aeration (See Table 15-1).

Monitoring fumigant concentrations outside the fumigated structure during fumigant aeration is required for commodity fumigants. This monitoring is conducted using low

concentration detectors to confirm workers and bystanders are not exposed to the fumigant concentrations above those permitted by the labeling (see Chapter 14, Monitoring Fumigant Concentration).

Clearance Testing

All fumigants require clearance testing of the aerated structure/commodity using a low concentration detector (see Chapter 6, Fumigant Low Concentration Detectors). The fumigant concentration must be equal to or less than the maximum airborne exposure limit for re-occupancy of structures (See [Table 5-1](#) in Chapter 5, Safety) or the maximum airborne concentration for releasing the commodity ([Table 15-1](#)). Generally, the maximum airborne concentrations for re-entry and release of commodities are the same.

Table 15-1. Label-prescribed minimum aeration times and terminal fumigant concentrations for commodity Fumigants; sulfuryl fluoride (SF, ProFume®), metallic phosphides (PH), and methyl bromide quarantine gas (MB Q).

Fumigant	Commodity	Minimum Aeration Time	Maximum Airborne Concentration
ProFume®	Bulk Food Commodities	24 hours active aeration	1 ppm SF
Metallic Phosphides	Animal Feed and Processed Foods	48 hours	0.3 ppm PH
Metallic Phosphides	Non-food Commodities	None	0.3 ppm PH
Metallic Phosphides	Tobacco in Hogsheads/ Other Containers	72 hours/48 hours	0.3 ppm PH
Methyl bromide ¹	General	4 hours - mechanical aeration ²	5 ppm MB
Methyl bromide ¹	General	12 hours – passive aeration ³	5 ppm MB

¹ The USDA APHIS PPQ may have additional aeration requirements as described in the PPQ treatment manual.

² Mechanical aeration requires the use of fans.

³ Passive aeration does not require the use of fans.

Florida Rules Require the Following for Clearance Testing

- Each business licensee location performing fumigation must own at least two, label-approved, clearance devices so that at all times, a licensee has access to a properly functioning clearance device which must be calibrated in accordance with either the device manufacturer or the fumigant labeling directions, whichever is more restrictive [\[5E-14.108\(7\)\]](#).
- Only a CO or SPID can use a label-approved low concentration detector (= clearance device) to determine residual fumigant concentration after the aeration procedure [\[5E-14.113\(1\)\]](#).
- Only a CO or SPID can declare a fumigated structure or enclosed space safe for entry and occupancy [\[5E-14.113\(2\)\]](#).

- In structures, the CO or SPID must determine that the fumigant concentration is at or below the maximum airborne exposure limit (See **Table 5-1** in Safety Chapter) in the breathing zone (area of space in each room of a fumigated structure where persons typically stand, sit, or lie down [\[5E-14.102\(13\)\]](#)).
- During the clearance testing of a multi-unit structure, each room in each unit must be individually tested [\[5E-14.111\(3\)\]](#) with a low concentration detector.
- No person, other than the CO, SPID, or FID, wearing an SCBA, may enter, occupy, or reoccupy the fumigated structure for any reason before completion of the aeration procedure(s) and declaration of clearance [\[5E-14.113\(1\)\]](#).
- All chloropicrin containers must be removed from the structure [\[5E-14.113\(1\)\]](#) (**Figure 15-1C**).

For SF residential fumigants, appliances that have remained closed during the fumigation, such refrigerators and freezers containing sealed food items, washers, dryers, ovens, etc., these appliances must be opened when clearing the structure until the SF concentration inside them is 1 ppm or less (**Figure 15-2A**).

Clearance Notice

After completing the above steps to determine the structure or enclosed space fumigated is safe for entry and occupancy, Florida rules require the CO or SPID must conspicuously post written clearance notices on all entrances of the fumigated structure or enclosed space (**Figure 15-2B**). The clearance notices (**Figure 15-2C**) must include the signature of the CO or SPID and the exact date and time of release for occupancy [\[5E-14.113\(2\)\]](#).

Treatment Notice

When fumigation is conducted to control of wood-destroying organisms in a building, a treatment notice must be posted adjacent to the access to the attic or crawl area or other readily accessible area (such as a water heater) of the fumigated building. The licensee's name and address, the date of treatment, the name of the fumigant used, and the wood-destroying organism for which treatment was performed must be stated on the notice [\[482.226\(5\)\]](#).



Figure 15-2. A: using a CLIRcheck to test for clearance of sulfuryl fluoride to 1 ppm or less in an oven that remained closed during the fumigation and aeration. B: after the structure is cleared, clearance notices are posted at each entryway. C: example of a clearance notice. (Photos: Douglas Products, R. Scheffrahn)

Review Questions for Chapter 15

129. Florida rules require that two SCBA and two persons trained in the use of the fumigant and SCBA must be present:
- At the first opening of the seal
 - During active aeration with all operable doors and windows open
 - To secure the structure after active aeration is completed
 - A and C
 - All of the above
130. When Florida rules require that two persons trained in the use of the fumigant must be present during aeration, one of these persons must be:
- An Identification cardholder with a Fumigation Identification Card endorsement on the employee identification card (FID)
 - A Certified Operator (CO) for fumigation
 - A Special Identification Cardholder (SPID)
 - B and C
 - Any of the above
131. An initial “active” aeration period for sulfuryl fluoride residential fumigants (Vikane and Zythor) must be conducted:
- For a minimum of one hour from the first opening of the seal
 - For a minimum of two hours after all doors are open
 - For a minimum of one hour after all operable doors and windows are open
 - None of the above
132. An initial “active” aeration period for sulfuryl fluoride residential fumigants (Vikane and Zythor) must:
- Be aided by the use of one or more fans
 - Use a fan with a total capacity of 5,000 cfm
 - Use a fan with a total capacity of 2,500 cfm
 - A and B
133. During the “passive” aeration period of sulfuryl fluoride residential fumigants (Vikane and Zythor), which of the following must occur:
- Windows must remain open
 - Exterior doors are locked, and secondary locks and barricades are reinstalled
 - Ventilation must continue using one or more fans with a total capacity of 5,000 cfm
 - All of the above
 - None of the above

134. Sulfuryl fluoride residential fumigants (Vikane and Zythor) require a minimum 6-hour aeration for an applied fumigant concentration of 16 oz/1000 ft³ or less. This required aeration time is measured from:
- The start of the active aeration until the structure is tested for clearance
 - The first opening of the seal until all tarps and seals are removed
 - The first opening of the seal until the structure is tested for clearance
 - None of the above
135. Which of the following actions are conducted during Aeration Procedures 1 and 2 for sulfuryl fluoride residential fumigants (Vikane and Zythor)?
- Opening all operable attic doors and accesses and directing a fan into the attic.
 - Removing chloropicrin evaporation containers
 - If the structure has an attached garage, closing the door between the garage and structure
 - A and B
 - All of the above
136. Commodity fumigants do not have step-by-step aeration procedures. Instead, the fumigator plans the aeration procedure and equipment needed for each fumigation as part of the Fumigation Management Plan (FMP).
- True
 - False
137. General practices to aerate commodity fumigants include:
- Aerating at ground level
 - Venting fumigant away from workers and bystanders
 - Directing aeration gases upwards
 - B and C
 - All of the above
138. Commodity fumigants do have some specific aeration requirements when aerating commodities to ensure the fumigant has sufficiently desorbed from the commodity before the fumigator releases it to the customer.
- True
 - False
139. When conducting clearance testing, the exception when the maximum airborne concentration permitted for release of a commodity is less than that for re-entry is for:
- Bulk food commodities fumigated using ProFume®
 - Tobacco fumigated using metallic phosphides
 - Animal feed and processed food fumigated using metallic phosphides
 - None of the above

140. Each business licensee location performing fumigation must own at least _____, label-approved, clearance device(s) so that at all times, a licensee has access to a properly functioning clearance device.

- a. One
- b. Two
- c. Three

141. Only _____ can use a label-approved low concentration detector to determine residual fumigant concentration after the aeration procedure and declare a fumigated structure or enclosed space safe for entry and occupancy.

- a. A Certified Operator (CO) for fumigation
- b. A Special Identification Cardholder (SPID)
- c. An Identification cardholder with a Fumigation Identification Card endorsement on the employee identification card (FID)
- d. A and B
- e. Any of the above

142. The breathing zone in a structure is defined as where a person typically:

- a. Spends the most time
- b. Stands, sits, or lies down
- c. Works, eats, or sleeps
- d. None of the above
- e. All of the above

143. During clearance testing, the following areas must be tested:

- a. Breathing zones in each room
- b. Crawlspace
- c. Inside a closed refrigerator only if it contains food
- d. A and C
- e. All of the above

144. After completing clearance testing to confirm the structure or enclosed space is safe for entry and occupancy, Florida rules require the CO or SPID must conspicuously post written clearance notices on:

- a. Every side of the structure
- b. On a front entrance to the structure
- c. On every entrance to the structure
- b. None of the above

145. The clearance notice must contain have the following information:

- a. The date and time aeration was initiated
- b. The type of clearance device used
- c. The date and time of release for occupancy
- d. B and C
- e. All of the above

146. When fumigation is conducted to control bed bugs in a building, Florida rules require that a treatment notice must be posted adjacent to the access to the attic or crawl area or other readily accessible area (such as a water heater) of the fumigated building.

- a. True
- b. False

Glossary of Fumigation Terms

Active aeration

Minimum 1-hour aeration of a structure for sulfuryl fluoride residential fumigants is conducted after the seal is opened, one or more circulating fans are on, and all operable doors and windows are open.

Alates

Also called "swarmers", these mature winged termites leave the colony during dispersal flights or "swarms." After flight, males and females pair, locate nest sites, and become future kings and queens of colonies. Alates constitute the reproductive caste.

Anobiid beetles or "deathwatch" beetles

Wood-infesting beetles belonging to the insect family Anobiidae, having heads covered by a hood-shaped pronotum, producing bun-shaped fecal pellets, and infesting both hardwoods and softwoods.

APHIS Animal and Plant Health Inspection Service

A division of USDA that includes the Plant Protection and Quarantine (PPQ) program which oversees fumigation of fresh imported commodities.

App

Short for "application," equivalent to "software program".

Barricade

A locking device that 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 operator or Special Identification Cardholder (SPID) or persons under their direct supervision.

Boiling point

Temperature at a given pressure (usually atmospheric) when a liquid instantaneously changes into a gas.

Bonnet

The screw-on metal cover that protects the valve and valve cover on the fumigation cylinder. Synonym of "valve cover" and "cylinder cap".

Buffer Zone

An area that surrounds an application site for methyl bromide where only specially trained and equipped fumigation personnel can enter.

Cartridge/canister respirator

A face mask connected to a cartridge or canister that removes specific chemicals, such as a fumigant, from the ambient air before inhalation by the person wearing the respirator.

Category I (highly toxic) pesticide

A pesticide that is considered highly toxic (LD50 < 50 mg/kg) and requires the signal words Danger – Poison and the skull and crossbones on its labeling. LD50 is the lethal dose to kill 50% of exposed test animals.

Certified operator

A person who has a current pest control operator's certificate from Florida Department of Agriculture and Consumer Services (FDACS) [\[482.021\(4\)\]](#) in one of four categories of pest control.

Certified operator in charge

A certified operator whose main occupation is pest control, is employed full-time by a licensee, and who is in charge of supervising the license holder's operation in the pest control category(ies) in which the operator is certified [\[482.021\(5\)\]](#).

Chloropicrin

The chemical used as a gaseous warning agent for sulfuryl fluoride residential fumigants; highly irritating at low concentrations causing immediate tearing and coughing.

Clearance

The final phase of aeration in which a low concentration detector such as an Interscan, SF-Explorer, or CLIRcheck for sulfuryl fluoride is used to determine that the fumigant concentration is at or below the maximum airborne exposure limit for re-occupancy of structures or release of commodities.

Clearance notice

A notice, signed by the Certified Operator or Special Identification Cardholder, indicating the fumigated structure has been declared safe for human occupancy. It must be posted at all entrances to the structure.

CLIRcheck

Tradename of PPM Messtechnik for an approved detection device of sufficient sensitivity used to confirm sulfuryl fluoride concentrations are 1 ppm for clearance testing and industrial hygiene monitoring.

Color diffusion detector tubes

These tubes utilize a pump to draw a specified volume of air through a tube containing a chemical reagent that changes color in presence of the fumigant. The length of the stain or intensity of the color is proportional to the fumigant concentration. These tubes are not approved for clearance testing and industrial hygiene monitoring for sulfuryl fluoride fumigants.

Commercial driver's license with Hazardous Materials Endorsement

A special driver's license permitting the holder to drive a vehicle that carries hazmat in placardable amounts.

Commissioner of Agriculture

The Statewide elected leader of the Florida Department of Agriculture and Consumer Services (FDACS).

Commodity

Any agricultural product for commercial consumption or use.

Compartmentalized fumigation

A fumigation applied to a restricted or localized space within a larger structure that has no connection to other parts of the structure so that area can be separately sealed and fumigated. Also known as "spot" fumigation.

Condensation

The change of a substance from a gas to a liquid, as a result of temperature drop or pressure increase.

Connected structures

Structures that are connected in such a way – by pipes, ducts, conduits, for example – that a fumigant can move by diffusion from one structure to another.

Dampwood termites

In Florida, termites (Kalotermitidae) that require a high moisture content for development and survival.

Desorption

Latent release of gas molecules into an airspace from attachment or adsorption onto a material or surface.

Dew point

The temperature at which water condenses as a liquid from the air.

Diffusion rate

The rate at which gas molecules disperse within spaces (such as rooms, cracks and crevices, voids, and termite

galleries) from areas of high concentration to areas of low concentration.

Dip tube

A tube inside a fumigant cylinder through which liquid fumigant is forced out of an upright cylinder through the release valve due to pressure within the cylinder.

Dosage

Dosage is determined by the equation Concentration (ounces) x Time (hours) and is measured in ounce-hours. The required ounce-hour dosage varies based on target pest species, the life stage of the pest, and the temperature at the site of the target pest.

Dose

The dose is the amount of fumigant introduced into a fumigated space. The dose is determined by 1) the exposure time, 2) the ounce-hour dosage to be accumulated, 3) the volume in cubic feet of the fumigated space, 4) fumigant confinement (also called half loss time), and 5) for sulfuryl fluoride residential fumigants only if the fumigation will be monitored.

Department of Transportation (DOT)

The Federal department that develops and regulates all policies related to the transport of hazmat.

Drywood termites

Termites of the family Kalotermitidae that live in sound, dry wood, and require no connection to the soil or other water sources.

ECO2FUME®

Tradename of Solvay for its cylinderized 2% phosphine mixed with 98% carbon dioxide.

Enclosed space

Area in which the fumigant is intended to be confined.

United States Environmental Protection Agency (EPA).

The federal agency responsible for registering pesticides and enforcing pesticide regulations.

Equilibrium

The time at which the concentration of fumigant is the same throughout the enclosed space indicating that the fumigant molecules are evenly dispersed.

Evaporation pan

A non-metallic container made for the placement of an absorbent material onto which liquid chloropicrin is

poured at least 5 minutes before release of sulfuryl fluoride residential fumigants.

Fact Sheet

An information sheet for sulfuryl fluoride residential fumigants provided to the customer that describes the fumigation process, the health effects of SF, and safety precautions and preparations to be taken before the fumigation.

False seam

A seam consisting of excess or slack from a single tarp that is tightly rolled and clamped to obtain a tighter fit on the structure. Also called “cold” seam.

Fan capacity

The displacement of air volume by a fan measured in Mcf.

Federal Food, Drug and Cosmetic Act (FFDCA)

A federal law, which regulates food, drugs, or cosmetics sold and used in the U.S. that requires EPA to set pesticide tolerances (maximum legally allowed levels) for pesticide residues in food.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

A federal law which requires all pesticides used in the United States to be registered by the EPA and authorizes the EPA to set labeling requirements to prevent harmful effects on health or the environment.

Fumigation Identification Card endorsement on the employee identification card (FID)

A fumigation employee who has received training by the Certified Operator for fumigation on basic fumigation procedures, SCBA (self-contained breathing apparatus) use, and the proper use of fumigant safety equipment.

First opening

The initial step in the aeration procedure when the enclosed space is first opened for aeration after the exposure period is completed.

Flammability

The ability of a chemical to burn or ignite, causing fire or combustion.

Florida Administrative Code

A set of regulations enforced by all State agencies, including the Florida Department of Agricultural and Consumer Services.

Fog out

Condensation of water in an air space caused by introducing sulfuryl fluoride too rapidly into a space resulting in rapid cooling of air below dew point.

Food Quality Protection Act

Enacted in 1996, this federal law amends both Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and Federal Food, Drug and Cosmetic Act (FFDCA), uses a single, health-based standard for all pesticides in all foods; uses special standards for infants and children; speeds up approval of ‘safer’ pesticides; and requires periodic re-evaluation of pesticides.

Frass

Insect debris such as fecal matter, wood dust, and soil particles.

Full-face shield

One type of protective eyewear required to be worn while applying sulfuryl fluoride, methyl bromide, or chloropicrin.

Fumeguard bags

Tradename of Ensyslex for special clear, nylon bags that are resistant to penetration by sulfuryl fluoride and used to protect foods and medicines during a fumigation using Zythor.

Fumicalc

The tradename of Ensyslex for the Zythor calculator application required by the labeling to determine the dose of Zythor to apply.

Fumigant

A chemical that, under room conditions, exists as a gas at a concentration that is lethal to a pest organism [\[482.021 \(8\)\]](#).

Fumigation

The use of a fumigant within a measured and enclosed space at a concentration and time period that is lethal to a target organism [\[482.021 \(9\)\]](#).

Fumigation Log

A record required by the Florida Department of Agriculture and Consumer Services that documents specific activities conducted during a fumigation using a sulfuryl fluoride residential fumigant.

Fumigation Management Plan

An organized, documented description of the steps involved to help ensure a safe, legal, and effective

fumigation. An FMP is required by the labeling for commodity fumigants. The FMP is site specific, is prepared before the fumigation, and is updated and revised throughout the fumigation.

Fumiguide

The tradename of Douglas Products for the Vikane calculator application and ProFume computer program, required by the labeling, to determine the dose of Vikane or ProFume to apply.

Fumiscope

A thermal conductivity monitor that measures the high concentrations of sulfuryl fluoride or methyl bromide present in an enclosed space.

Gas Loss Index

Another name for half loss time used only in the Zythor labeling and the Fumicalc.

Goggles

One type of protective eyewear required to be worn while applying sulfuryl fluoride fumigants.

Ground seal

The boundary formed between the tarpaulin or wall construction and the ground.

Half-loss time

The amount of time it takes to lose half the amount of fumigant from an enclosed space because of leakage or sorption.

Halogen leak detector

A device used for locating fumigant leaks from an enclosed space.

Hanging bonnet

A modified bonnet used as a harness to suspend a sulfuryl fluoride (SF) cylinder from a hanging scale when used to measure the pounds of SF to apply.

Hazmat

A contracted form of the term 'hazardous material'.

Heat exchanger

A device used during the introduction of methyl bromide (MB) to heat the liquid fumigant to at least 150°F so MB will volatilize to a gas into the attached introduction hose. A heat exchanger heats liquid MB by passing it through coils submerged in an automotive coolant bath.

Higher termites

The most derived termite family having a sterile worker caste and no protozoa to aid in digestion of wood. They are in the termite family Termitidae.

Hot seam

A seam that is formed when two separate tarps are rolled and clamped together. A poorly clamped hot seam will leak fumigant.

Interscan Gas Analyzer

An approved detection device of sufficient sensitivity used to confirm sulfuryl fluoride concentrations are 1 ppm for clearance testing and industrial hygiene monitoring.

Introduction hose

The hose through which sulfuryl fluoride or methyl bromide is introduced into a structure or space; it runs from the fumigant cylinder release valve or heat exchanger and ends inside the space to be fumigated; it should be kink-resistant, flexible, and for sulfuryl fluoride have a minimum burst pressure of 500 pounds per square inch. Also called "shooting" hose.

Introduction stand

A supporting structure that securely holds the end of the introduction hose to keep it off the floor and direct the incoming sulfuryl fluoride towards the circulating fan thus ensuring rapid dispersion to prevent a 'fog-out'.

Label

A document, also called a specimen or container label, containing detailed instructions for the legal and proper use of an US Environmental Protection Agency (EPA)-registered pesticide.

Labeling

Documents including the specimen/container label and the manual which provide detailed instructions for the legal and proper use of an US Environmental Protection Agency (EPA)-registered pesticide.

Larva

The immature stage of insects that undergo complete metamorphosis in which the young look completely different than the adult, for example caterpillar/butterfly, maggot/fly. The name also is used for very young termites.

Licensee

A person, partnership, firm, corporation, or other business entity having a license issued by the department for engaging in the business of pest control at a particular business location [\[482.021\(18\)\]](#).

Mcf

One thousand cubic feet. The Roman numeral “M” represents 1,000.

Measuring wheel

A wheel equipped with a handle and calibrated counter that is pushed along a surface to measure linear distances.

Methyl bromide

A fumigant now used in Florida mainly for quarantine and regulatory fumigations. Methyl bromide “Q” gas fumigations must be supervised by a regulatory agent.

Monitoring

Measuring fumigant concentrations in the fumigated space during the fumigation exposure period. These measurements are used to determine if the necessary ounce-hour dosage is being accumulated.

Monitoring (Industrial Hygiene)

Measuring fumigant concentrations outside the fumigated space during the fumigant introduction, exposure period, and aeration to confirm that workers and bystanders are not exposed to the fumigant concentrations above those permitted by the labeling.

Monitoring hoses

Plastic tubes that run from separated locations in a structure to a high concentration monitor, such as a Fumiscope or SF-ReportIR; used when actual rather than estimated fumigant concentrations are needed during a fumigation.

Multi-unit dwelling

A structure having one or more stories containing tenants that share common walls in stores, offices, apartments, townhouses, and condominiums.

Notification

A requirement before any fumigation in which the Certified Operator must give written notice using the Florida Department of Agriculture and Consumer Services (FDACS) website of where and approximately when a fumigation will take place.

Nylofume bags

Tradename of Douglas Products for special clear, nylon bags that are resistant to penetration by sulfuryl

fluoride and used to protect foods and medicines during a fumigation using Vikane or Zythor.

Old House Borer

A beetle in the family Cerambycidae that infests lumber. Larvae chew extensive galleries and adults leave oval-shaped exit holes in infested wood when they emerge.

Packing nut

The part of the cylinder valve that provides a liquid/gastight seal around the valve stem. A leaking shut-off valve suggests a problem with the packing nut.

Parts per million (ppm)

A measure of concentration in which there is a number of parts of a substance in 1,000,000 total parts of another substance. Thus 1 ppm equals one part in 1 million total parts.

Passive aeration

Aeration without the use of fans.

Pest Control Enforcement Advisory Council

An 11-member council appointed by the Commissioner of Agriculture that gives advice on pest control regulation to the Commissioner, advises state agencies on regulation enforcement, compliance, and consumer protection, and promotes public understanding of the pest control industry.

Phosphine

A commodity fumigant produced most commonly from the reaction of aluminum or magnesium phosphide pellets with moisture in the air.

Placard

A durable sign required on all vehicles transporting hazmat, it must have on it the hazard class text and the class number of the hazmat on board.

Polyethylene

A plastic film composed of a strong, lightweight, chemical-resistant polymer (molecule made of repeated units).

Product stewardship policy

A written policy required by the Florida Department of Agriculture and Consumer Services, for registrants of residential fumigants to provide to licensees who use these products [\[5E-2.0312\]](#). The stewardship policy must include a description of stewardship training, Quality Assurance Reviews (QARs), and procedures for issuing probation or stop sale notices to licensees

Powderpost beetles, false

Wood-infesting beetles in the beetle family Bostrichidae usually with heads hidden beneath a hood-like pronotum that has small bumps or projections on it. They produce a frass that is a coarse powder mixed with some small pellets. Commonly infesting hardwoods.

Powderpost beetles, true

Small, elongate beetles in the family Lyctidae that attack hardwood and bamboo, and produce a fine, powder-like frass.

ProFume

Tradename of Douglas Products for its sulfuryl fluoride commodity fumigant.

Pronotum

The part of an insect located just behind the head, it is the upper surface of the first segment of the thorax; in termites and some beetles, it is a shield-like plate. In other beetles it is a bell- or hood-shaped piece that projects over the head.

Quality Assurance Review (QAR)

A job site inspection conducted by a representative of the registrant of sulfuryl fluoride residential fumigants (Vikane or Zythor) as required by Florida regulations to determine if a fumigation is done per label and Florida requirements.

Quarantine fumigation

Fumigations usually conducted at international ports-of-entry, to eradicate exotic pests that may be infesting shipments of agricultural or material goods.

RDA Fumiscope

A remote monitor that has data transmission capabilities and do not require the fumigator to be on-site to take readings. This monitor can measure sulfuryl fluoride concentrations in multiple locations within the fumigated space and communicate readings via cellular or satellite transmission to a host computer. The fumigator can view these readings via smart phone, computer, or similar device.

Re-entry concentration

The threshold concentration of a fumigant at or below which it is safe for a structure to be reoccupied; for sulfuryl fluoride it is 1 ppm.

Release valve

The valve at the top of the cylinder which must be turned to release the fumigant.

Reoccupancy

The point after a fumigation when a structure can be safely entered and inhabited without the use of safety equipment.

Residential fumigants

Sulfuryl fluoride products (Vikane and Zythor) registered for application to residential structures.

SCBA

Self-contained breathing apparatus: a breathing device that allows the wearer to safely occupy a structure that has above-threshold levels of fumigant and chloropicrin; it consists of a full face mask with a hose connected to an air tank carried on the back, air is delivered via positive pressure thus preventing harmful gas from entering the mask.

SDS

Safety Data Sheet. A document containing information on a specific chemical's physical and chemical properties, data on toxicity and other health-related concerns, and instructions for treatment in case of accidental exposure.

Secondary locks

A locking device that 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 operator or Special Identification Cardholder (SPID) or persons under their direct supervision. Examples include clam shell locks, split keys, J-lock, chains, padlocks, etc.

SF400

A remote monitor that has data transmission capabilities and does not require the fumigator to be on-site to take readings. This monitor can measure sulfuryl fluoride concentrations in multiple locations within the fumigated space and communicate readings via cellular or satellite transmission to a host computer. The fumigator can view these readings via smart phone, computer, or similar device.

SF-ExplorIR

Tradename of Spectros Instruments for an approved detection device of sufficient sensitivity used to confirm sulfuryl fluoride concentrations are 1 ppm for clearance testing and industrial hygiene monitoring.

Shipping Papers

A document that describes a hazmat being transported; it contains the name, hazard class or division, amount, identification number, and packing group of the material.

Shooting fan

A circulating fan that is directed toward the outflow of the introduction hose.

Snake

Tubular bags filled with sand, gravel, or water that are used to weigh down the tarps and establish an effective ground seal. They can also prevent tarps from being blown loose by winds.

Soldier

A termite caste that is adapted for defending the colony against enemies such as ants; adaptations include large, heavy mandibles, thick, plug-shaped heads, or pores or snouts that secrete noxious chemicals. Soldiers are useful for species identification.

Sorption

The process of fumigant being taken up (absorption) or held (adsorption) onto materials and surfaces.

Special fumigation identification card holder (SPID)

A person who has a Florida Department of Agriculture and Consumer Services (FDACS)-issued ID card showing that he or she is licensed to perform fumigations.

Structural Pest Control Act, Chapter 482

The chapter within Title XXXII (32) of the Florida Statutes, which is a collection of state laws that contains all the state regulations for pest control including fumigation.

Subterranean termites

Termites, in the families Rhinotermitidae and Termitidae, that nest underground, build subterranean tunnels, and forage above ground for wood and other materials containing cellulose.

Sulfuryl fluoride

The active ingredient in the fumigant known by the trade names Vikane, Zythor, and ProFume. At atmospheric pressure, it becomes a gas at -67°F.

Swarmers

Also called alates, these mature winged termites leave the colony during dispersal flights or swarms. After

flight, males and females pair, locate nest sites, and become future kings and queens of colonies. Swarmers constitute the reproductive caste.

Swarming

Dispersal flights of winged, sexually mature termites for the purpose of mating and starting new colonies.

Tape-and-seal

A type of fumigation which is allowed when the main exterior of a structure is relatively gas tight and free of infested wood so that tarping is not required. Areas of leakage such as windows, doorways, and vents are made gas-tight using polyethylene sheeting and tape.

Tarpaulin

A large vinyl-coated nylon, canvas, or polyester sheet used to seal a structure or other spaces for fumigation. Also called "tarps".

Tarp apron

The amount of tarp between the ground seal (where snakes are placed) and the end of the tarp resting on the ground.

Tarped stack fumigation

When materials, such as furnishings, equipment, or commodities, are covered with tarpaulins for fumigation. These fumigations can be conducted outdoors or indoors.

Underseal

The substrate beneath a structure being fumigated. This can be a concrete foundation or a crawl space and the soil type beneath it.

United States Department of Agriculture (USDA)

The federal department in charge of all aspects of agriculture; it also manages agricultural, forest, and range lands; supports farming; and promotes domestic agriculture and forestry in the world economy.

Valve cover

A cap that screws on to the cylinder valve opening used to prevent accidental release of fumigant even if the valve is opened.

Vapor density

The weight of a gas compared to the weight of air.

Vapor

A term often used in place of "gas".

VAPORPHOS

Trade name of Solvay for its 100% cylinderized phosphine that is blended with carbon dioxide directly on-site during application.

Vapor Pressure

The pressure exerted within a space by a gas evaporating from a liquid.

Vikane

The trade name of Douglas Products for its sulfuryl fluoride residential fumigant.

Water solubility

The measure of the amount of chemical substance, such as a fumigant, that can dissolve in water at a specific temperature.

Warning sign

A sign that must be posted at all external entrances and all sides of a structure warning that the structure is being fumigated. It also contains information on who is performing the fumigation and contact information in case of emergency.

Wing venation

The pattern of veins in an insect wing.

Wood-boring beetles

Beetles whose larvae feed on and whose adults bore through wood.

Wood-destroying insect (WDI)

Any insect that attacks and damages wood, especially termites and wood-boring beetles.

Wood-destroying organism (WDO)

Organisms that damage and can reinfest seasoned wood in a structure, termites, powder-post beetles, old house borers, and wood-decaying fungi. (Chapter 482.021(30))

Workers

In termites, the caste in a termite colony responsible for maintaining the nest, caring for the eggs, feeding all members of the colony, and foraging for food. Workers are the termite caste that causes damage to structural wood.

Zythor

The trade name of Ensysyex for its sulfuryl fluoride residential fumigant.

Answers to Review Questions

1. c. Ants
2. e. All of the above
3. c. Bark beetle
4. b. Mud tubes, often a contact to the soil for access to moisture
5. c. Drywood termites
6. c. Vikane® and Zythor®
7. d. All of the above
8. b. Any employee working on the tent crew not involved in fumigant introduction, initiating aeration and final clearance testing
9. a. Storage and transportation of the residential fumigant
10. a. True
11. c. Vikane® and Zythor®
12. a. True
13. b. Phosphine
14. b. False
15. c. Spontaneous ignition
16. d. A and B
17. b. False
18. e. All of the above
19. d. A and C
20. a. Decompose in the high heat of glowing heat elements and open flames
21. c. Inhalation
22. c. More than two
23. d. A and C
24. a. True
25. e. All of the above
26. b. Chloropicrin
27. c. Full-face shield or goggles
28. b. Full-face shield or safety glasses
29. c. 15 – 20 minutes
30. a. Methyl bromide
31. c. 1 ppm
32. d. All of the above
33. a. True
34. d. A and C
35. e. All of the above
36. a. True
37. b. Two
38. d. SF-ReportIR
39. b. One month
40. b. False
41. d. B and C
42. e. All of the above
43. a. True
44. c. payment, fumigation
45. b. FDACS Consumer Notice Form, Fumigation Fact Sheet
46. a. The complete name of the Certified Operator in charge of the fumigation
47. b. False
48. e. All of the above
49. e. All of the above

- 50. d. B and C
- 51. b. 24 hours
- 52. d. A and B
- 53. a. Using FDACS electronic fumigation notification website
- 54. c. Cost of the fumigation
- 55. b. False
- 56. d. Sulfuryl fluoride residential fumigants
- 57. e. All of the above
- 58. a. True
- 59. a. WDO
- 60. d. All of the above
- 61. a. True
- 62. c. Imaging tools such as Google Earth
- 63. c. 39,200 ft³
- 64. d. A and B
- 65. a. True
- 66. d. All of the above
- 67. b. Placing tarps over mulch, gravel, or bark chips
- 68. d. A and B
- 69. b. False
- 70. d. B and C
- 71. b. Chloropicrin is introduced in the tarped stack if fumigated using a SF residential fumigant
- 72. e. All of the above
- 73. a. True
- 74. d. None of the above
- 75. a. True
- 76. a. Opened tube of toothpaste
- 77. b. Are removed or the fish are removed
- 78. d. A and B
- 79. e. A and C
- 80. b. False
- 81. a. True
- 82. b. Exterior doors and entrances do not need to be posted with warning signs when the structure is tarped
- 83. e. All of the above
- 84. a. True
- 85. b. False
- 86. d. A and B
- 87. c. Fumigant concentration and exposure time
- 88. b. False
- 89. e. All of the above
- 90. a. Drywood termites
- 91. b. Eggs
- 92. b. False
- 93. c. The dosage for sulfuryl fluoride increases
- 94. b. 40°F
- 95. c. By measuring the indoor slab temperature using a surface or laser thermometer
- 96. a. The amount of fumigant introduced into the fumigated space
- 97. c. Relative humidity
- 98. b. Fumigant equilibrium until the initiation of aeration
- 99. c. For the initial fumigant concentration to be reduced by half
- 100. d. Relative humidity
- 101. a. 33%
- 102. b. False

- 103. a. 10,000 – 15,000 ft³
- 104. b. False
- 105. c. 1500 ounce-hours
- 106. c. Of the time for metallic phosphides to react with moisture to produce phosphine
- 107. d. A and B
- 108. c. Locked rooms, compartments, and closets do not need to be inspected
- 109. a. True
- 110. b. False
- 111. d. B and C
- 112. c. Three
- 113. d. The applicator must wear an SCBA when applying at more than two introduction sites
- 114. e. None of the above
- 115. d. 500
- 116. d. A and B
- 117. a. True
- 118. b. By probing into or applying to the commodity surface
- 119. a. True
- 120. c. When conducting a quarantine fumigation.
- 121. e. All of the above
- 122. b. On each floor of a multistory building.
- 123. a. SF-ReportIR
- 124. d. All of the above
- 125. c. Equilibrium and before aeration.
- 126. a. SF400
- 127. b. False
- 128. d. Vikane® and Zythor®
- 129. e. All of the above
- 130. d. B and C
- 131. c. For a minimum of one hour after all operable doors and windows are open
- 132. a. Aided by the use of one or more fans
- 133. b. Exterior doors are locked, and secondary locks and barricades are reinstalled
- 134. c. The first opening of the seal until the structure is tested for clearance
- 135. d. A and B
- 136. a. True
- 137. d. B and C
- 138. a. True
- 139. d. None of the above
- 140. b. Two
- 141. d. A and B
- 142. b. Stands, sits, or lies down
- 143. a. Breathing zones in each room
- 144. c. On every entrance to the structure
- 145. c. The date and time of release for occupancy
- 146. b. False

LABELS

Specimen Label

RESTRICTED USE PESTICIDE DUE TO INHALATION TOXICITY

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.



SPECIALTY GAS FUMIGANT

®Trademark of Douglas Products and Packaging Company ("Douglas")

For control of: Existing infestations of listed insects and related pests such as drywood termites, Formosan termites, powder post beetles, death watch beetles, old house borers, bedbugs, cockroaches, clothes moths, rodents (rats, mice), and the larvae and adults of carpet beetles (except egg stage), oriental, American, and brown-banded cockroaches.

For use in: Dwellings (including mobile homes), buildings, construction materials, furnishings (household effects), shipping containers and vehicles including automobiles, buses, surface ships, passenger railcars, and recreational vehicles (but not including aircraft).

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 Douglas Products' Sulfuryl Fluoride Training and Stewardship Plan.

Active Ingredient	
sulfuryl fluoride.....	99.8%
Other Ingredients.....	0.2%
Total	100.0%

EPA Reg. No. 1015-78

Keep Out of Reach of Children

DANGER  **POISON**

PELIGRO

Precaución al usuario: Si usted no lee inglés, no use este producto hasta que la etiqueta le haya sido explicada ampliamente.

Precautionary Statements

Hazards to Humans and Domestic Animals

Extremely Hazardous Liquid And Vapor Under Pressure • Fatal If Inhaled • May Be Fatal If Swallowed • Liquid May Cause Freeze Burns of Exposed Skin

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

First Aid

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.

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 on 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 further treatment advice.

If liquid is 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.

Note to Physician: Vikane 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 Vikane 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 can result in significant lung and kidney damage. Single exposures at high concentrations have resulted in death. Treat symptomatically.

Liquid Vikane in the eye may cause damage due to refrigeration or freezing.

Refer to elsewhere on this label for additional precautionary information and Directions for Use.

Notice: Read the entire label. Use only according to label directions. **Before using this product, read Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies elsewhere on this label. If terms are unacceptable, return at once unopened.**

In case of emergency endangering health or the environment involving this product, call 1-844-845-3129 or 1-352-323-3500.

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

Directions for Use

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

Read all Directions for Use carefully before applying.

Storage and Handling

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

Cylinders must not be subjected to rough handling or mechanical shock such as dropping, bumping, dragging, or sliding beyond that which would normally occur when moving cylinders. 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

Storage and Handling (Cont.)

unprotected persons until concentration of fumigant in the breathing zone (areas within the structure where individuals typically stand, sit or lie down) is determined to be 1 part per million (ppm) or less, as determined by a detection device with sufficient sensitivity such as an INTERSCAN, MIRAN [SapphiRe] or Spectros ExplorIR gas analyzers. For more detailed information on the source and use of air monitoring devices or respirators, consult the Vikane Gas Fumigant Structural Fumigation Manual.

Cylinder and Product Disposal: Promptly return all empty cylinders to your distributor of Vikane. Follow proper cylinder handling directions above.

Pesticide wastes are acutely hazardous. 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.

Information

The Structural Fumigation Manual is part of the labeling for Vikane. Before using, read and follow all label precautions and directions. Prior to the parties entering into a fumigation agreement, the Fact Sheet for Vikane must be provided to an adult occupant of the structure to be fumigated.

Vikane is a highly hazardous material and must be used only by individuals knowledgeable of the hazards of this chemical and trained in the use of required respiratory equipment, fumigant detection devices, emergency procedures, and in the proper use of this fumigant.

When used for fumigation of enclosed spaces, such as houses and other structures, warehouses, vaults, chambers, trucks, vans, boxcars, ships, and other transport vehicles, 2 persons trained in the use of this product, at least one being an applicator who is licensed/certified by the state, must be present during introduction of fumigant, reentry prior to aeration, and during the initiation of the initial aeration procedure when exposure exceeds 1 ppm. **Two persons need not be present if monitoring is conducted remotely (outside the area being fumigated) and no one enters the fumigated structure.**

If fumigating for insect pests, do not apply when temperature at site of pest activity is below 40°F. This temperature may be measured at the slab foundation, sub-floor soil, or wherever the coolest part of the structure may be. This restriction does not apply when fumigating for rodents.

When fumigating a single unit/room within or connected to a larger structure (such as town houses, apartments, condominiums), all units of the entire structure must be vacated during the fumigation and aeration periods.

Remove food, feed, drugs, and medicinals from the structure before the fumigation if they cannot be adequately sealed to prevent exposure to Vikane. Chloropicrin must be used as described on this label to warn of an ongoing fumigation.

Preparation for Fumigation

Structural Fumigation

Remove from the structure to be fumigated all persons, domestic animals, pets, and desirable growing plants. See the Structural Fumigation Manual for instructions regarding the handling of fish tanks. For mattresses (excluding waterbeds) and pillows completely enveloped in waterproof coverings, do one of the following: 1) open the seal of the water proof covering or 2) remove the mattress or pillow from the space to be fumigated if the waterproof covering cannot be opened. Mattresses and pillows with waterproof coverings containing built-in vents designed to permit air passage are considered to have an open seal to the waterproof covering and can remain as-is in the fumigated space. Food, feed, drugs (including tobacco products), and medicinals (including those items in refrigerators and freezers) can remain in the structure if they are in plastic, glass, or metal bottles, cans, or jars with the original manufacturer's air-tight seal intact. Food, feed, drugs (including 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 Nylofume® bags, which are available from distributors of Vikane.

Note: 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 which will be included in the space to be fumigated.

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 Vikane in them is 1 ppm or less.

Multi-Unit Structures: When fumigating a single unit/room within a larger structure (such as townhouses, apartments, condominiums), all units of the entire structure must be prepared as a fumigated structure, and all applicable rules, regulations and label instructions apply, such as occupant notification, structure preparation, posting, securing, and aeration. An adult occupant of each currently-occupied unit must be provided with the Fact Sheet for Vikane. Ensure that all exterior entranceways and exterior doors providing access to individual units are secured with secondary locks (see Securing Structure Entrances) so that only the state licensed applicator in charge can gain access. Chloropicrin need only be used in the fumigated space where Vikane is introduced. During Step (3) of Aeration Procedure 1 or 2, check all units within the fumigated structure for concentrations of Vikane with an approved clearance device. If the concentration of Vikane is greater than 1 ppm in the breathing zone (i.e., areas within the structure where individuals typically stand, sit or lie down) in a unit, ventilate the unit with operable doors and windows open and continue to measure the concentration of Vikane until it is 1 ppm or less. Structure may be reoccupied when concentrations in the breathing zones in all units is 1 ppm or less.

Connected Structures: A connected structure is defined as any structure connected with the structure to be fumigated by construction elements (e.g., pipes, conduits, ducts, etc.) which may allow passage of fumigant between the structures. If state rules and regulations do not describe or permit a process to isolate and seal a connected structure to prevent passage of fumigant from the fumigated structure, then the connected structure must be vacated during the fumigation. When it is necessary to vacate any connected structure, that structure shall be considered as a fumigated structure and all applicable rules, regulations and label instructions apply, such as occupant notification, structure preparation, posting, securing, and aeration. Chloropicrin need only be used in structures where Vikane is introduced. Concentration levels of Vikane must be measured in the breathing zones (areas within the structure where individuals typically stand, sit or lie down) (see Aeration and Reentry) in any connected space or structure to confirm concentrations are 1 ppm or less before structure can be reoccupied.

Tarpaulin Fumigation

Open operable windows as permitted by local and state regulations. When tarping, use a highly resistant material such as a vinyl coated nylon, or polyethylene sheeting of at least 4 mil thickness. Seal all seams. Seal the bottom edges of the cover to the ground using materials such as soil, sand, or weighted "snakes." To minimize escape of gas through the soil and to avoid injury to nearby plants, wet soil outward from foundation to the cover if not sufficiently moist to act as a barrier for the gas.

Taped Fumigation

For fumigation sites that can be sealed with plastic, paper, or tape, seal adequately around doors, windows, vents, and other openings.

Chamber Fumigation

For chamber fumigation use a tightly-sealed chamber with adequate circulation.

Construction Materials, Furnishings (Household Effects), Vehicles, and Shipping Containers

Follow preparations as appropriate in above paragraphs for chamber, taped fumigation, or tarpaulin fumigation to assure good confinement of the gas for the recommended period of exposure.

Fumigation of Surface Ships in Port

Surface ships in size up to and including large ocean-going ships may be fumigated with Vikane to control the various pests listed. The professional fumigator and the ship's captain (or owner) shall follow all applicable regulations including those listed in the Coast Guard, DOT, Title 46, Shipping section, Parts 147A.1-147A.43. Except for those persons involved in fumigation, no people, plants, or pets may be on board during fumigation.

The person responsible for the fumigation must notify the master of the vessel, or his representative, of the requirements relating to personal protection equipment and detection equipment. Emergency procedures, cargo ventilation, periodic monitoring and inspections, and first aid measures must be discussed with and understood by the master of the vessel or his representative.

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

Food, feed, drugs, and medicinals shall not be exposed to the fumigant. If not removed from the vessel they shall be protected from exposure. The vessel must not be moved during the fumigation and aeration periods. If reentry is necessary before aeration is completed, positive pressure self-contained respiratory protection must be worn.

Warning Agent
Chloropicrin is a warning agent introduced into the structure during fumigation. In order to avoid direct exposure to the fumigant being released, chloropicrin must be released within the structure at least 5 to 10 minutes prior to introduction of the fumigant. Place a handful of wicking agent (e.g., cotton) in a chloropicrin evaporation container(s). Do not use chloropicrin evaporation containers or application equipment made of magnesium, aluminum, or their alloys as chloropicrin may be severely corrosive to such metals. To enhance the distribution of chloropicrin throughout the structure, place the chloropicrin evaporation container in the air stream of a fan. Pour chloropicrin over the wicking agent. When adding chloropicrin to evaporation containers, dispense no more than 3 fl oz per container. Use 1 fl oz/10,000 to 15,000 cubic feet (30 ml/283 to 425 cubic meters) of space to be fumigated or follow dosage rate calculated by the electronic Fumiguide™ system. Establish at least one chloropicrin introduction site for each 45,000 cubic feet of space to be fumigated. When applying chloropicrin at multiple chloropicrin introduction points within a structure, start at the point farthest from the exit and work toward the exit. Removal of all chloropicrin evaporation containers from the fumigated space during the initial phase of aeration after tarp removal will aid in the dissipation of the warning agent from the structure.

Chloropicrin need not be used when fumigating passenger railcars; however, a thorough walk-through inspection must be performed of each railcar with doors being immediately locked upon leaving each car, and a guard must be posted during fumigant introduction, exposure period, and aeration.

Chloropicrin is a warning agent which causes smarting of the eyes, tears, and discomfort, and has a very disagreeable pungent odor at very low concentrations. Chloropicrin must be used by persons certified to apply Vikane or under their supervision. Applicators must observe the chloropicrin precautionary statements and personal protective equipment appearing on this label. See the Warning Agent section of the Structural Fumigation Manual.

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 liquid Vikane until thoroughly aerated and cleaned.

Respiratory Protection
If the concentration of Vikane in the breathing zone (areas within the structure where individuals typically stand, sit or lie down) of the fumigated area (as measured by a detector device with sufficient sensitivity such as an INTERSCAN, MIRAN [SapphiRe] or Spectros ExplorIR gas analyzers) does not exceed 1 ppm (4 mg/cubic meter), no respiratory protection is required. When this concentration is exceeded, 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 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. For more detailed information on the source and use of air monitoring devices and respirators, consult the Vikane Gas Fumigant Structural Fumigation Manual.

Prefumigation Check: Check for potential leaks.

Securing Structure Entrances
To secure the structure against unauthorized entry during the fumigation exposure period and Step 2 of Aeration Procedure 1 or 2, use a locking device or barricade 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 instructions and restrictions on securing against entry.

Securing Passenger Railcars
Follow either Procedure #1 or Procedure #2 for securing railcars.

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 exposure period, use a locking device or barricade on all exterior doors or doorways. A locking device or barricade must be demonstratively 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.

Dosage and Exposure Time
For fumigation to control drywood termites and non-egg stages of other insect and related structural and household pests, the Fumiguide calculator(s) is to be used for the coordination of fumigant rates with soil or slab temperature, exposure period, and fumigant loss rate measured as half-loss-time (HLT). When control of the egg stage is desired or when fumigating for Formosan termites, use the indicated multiple factor of the drywood termite dosage (as determined by Fumiguide calculator(s)) for pests listed in the following table:

Pest	Dosage Factor (as a multiple of drywood termite dosage)
rodents ¹	1/2X
carpet beetles ² , German cockroaches, and other cockroach species ²	1X
Bedbugs	1.9X
furniture carpet beetles ²	3X
old house borers and Formosan termites	4X
clothes moths	6X
powder post beetles and death watch beetles	10X

These dosages apply to dwellings, buildings, construction materials, furnishings, and vehicles.

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

¹To 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.

²More than one fumigation may be needed to control the infestation after egg hatch.

For fumigation to control rodents, use sufficient gas to accumulate at least 36 ounce-hours following equilibrium, regardless of ambient air temperature. Refer to the Vikane Gas Fumigant Structural Fumigation Manual.

The Fumiguide B Calculator is to be used for unmonitored structures to coordinate fumigant rates with temperatures, a 20- to 24-hour exposure period, and an estimated HLT.

The Fumiguide Y Calculator is used in conjunction with Fumiguide B when fumigant concentrations are monitored and/or there are measured variations in exposure time.

The Fumiguide Calculator is a hand-held microprocessor which performs the functions of both the Fumiguide B and Y calculators and includes relative humidity as a calculating factor.

Software versions of the Fumiguide Calculator may be available. Contact Douglas Products and Packaging Company or your distributor of Vikane for information on where to obtain the Fumiguides and referenced literature.

Introducing the Fumigant
Release the fumigant from outside the structure, tarp, or vehicle. The release point(s) should be into a large open space(s) in the fumigation site(s). Release the fumigant through a suitable leak-proof tube with a minimum burst pressure of 500 pounds per square inch (psi). Direct the fumigant into the blast of air from a fan(s) having a capacity of at least 1,000 cubic feet per minute (cfm) for each pound of Vikane released per minute. Damage to household materials can occur if insufficient fan

capacity is used for the rate of Vikane released. It is recommended that protective sheeting, such as polyethylene plastic under the shooting stand, shooting hose, and shooting fan be used to further protect floors during application. **To prevent damage, do not apply fumigant directly to any surface.**

Posting of Fumigated Areas

The applicator must post all entrances to the fumigated areas with signs bearing, in English and Spanish:

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 Vikane within the structure where individuals typically stand, sit or lie down, is 1 ppm or less.

Aeration and Reentry

Structures

No one is allowed in treated areas if the level of Vikane is above 1 ppm unless provided with 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. **Note: During the initial one hour aeration procedure, approved respiratory protection must be worn until the concentration of Vikane is confirmed not to exceed 1 ppm with an approved detection device.** Since the INTERSCAN, MIRAN [SaphiRe] and Spectros ExplorIR gas analyzers 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.

Only an approved detection device of sufficient sensitivity, such as the INTERSCAN, MIRAN [SaphiRe] or Spectros ExplorIR gas analyzer, can be used to confirm a concentration of Vikane of 1 ppm or less. The INTERSCAN must be calibrated according to manufacturer recommendations within one month prior to use as a clearance device. All other approved detection devices must be calibrated according to manufacturer recommendations. The concentration of Vikane must be monitored in breathing zones (areas within the structure where individuals typically stand, sit or lie down). Structure must remain posted for fumigation until cleared for reentry.

Open all operable attic doors and accesses and direct a fan into the attic. If the structure has an attached garage, the door between the garage and structure should be open. If the structure has a central air handling system, the fan (or blower) should be activated for each unit if operational. As an alternative, a fan may be placed in front of a furnace inlet to blow air into central heating and cooling ducts.

Select the appropriate procedure based on the fumigation rate:

All structures fumigated at 16 oz/MCF or less may be aerated using procedures 1 or 2.

All structures fumigated at concentrations greater than 16 oz/MCF must be aerated using procedure 2.

Aeration Procedure 1

These steps must be completed in sequence.

Step (1): Aerate structure with all operable windows and doors open, aided by the use of one 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 Vikane in breathing zones of each room. If the concentration of Vikane is greater than 1 ppm, ventilate structure with operable doors and windows open and confirm concentrations are 1 ppm or less before the structure is reoccupied.

Aeration Procedure 2

These steps must be completed in sequence.

Step (1): Aerate structure with all operable windows and doors open, aided by the use of one 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 Vikane in breathing zones of each room. If the concentration of Vikane is greater than 1 ppm, ventilate structure with operable doors and windows open and confirm concentrations are 1 ppm or less before the structure is reoccupied.

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 procedure:

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 4000 cfm capacity per floor. A bilevel railcar would require 8000 cfm capacity or greater - 4000 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 reoccupied when the concentration of Vikane 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 Spectros ExplorIR gas analyzers.

Aeration Procedure 2:

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

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 4000 cfm capacity per floor (in addition to on-board systems). A bilevel railcar would require 8000 cfm capacity or greater - 4000 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 Vikane 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 Spectros ExplorIR gas analyzers.

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

Terms and Conditions of Use

If terms of the following Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies are not acceptable, return unopened package at once to the seller for a full refund of purchase price paid. Otherwise, use by the buyer or any other user constitutes acceptance of the terms under Warranty Disclaimer, Inherent Risks of Use and Limitation of Remedies.

Warranty Disclaimer

Douglas Products and Packaging Company warrants that this product conforms to the chemical description on the label and is 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 PERMITTED BY LAW, DOUGLAS PRODUCTS MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

Inherent Risks of Use

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 low temperature, soil conditions, etc.), abnormal conditions (such as excessive wind, tornadoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of Douglas Products or the seller. All such risks shall be assumed by buyer.

Limitation of Remedies

To the extent permitted by 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, at Douglas Products' election, one of the following:

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

Douglas Products shall not be liable for losses or damages resulting from handling or use of this product unless Douglas Products is promptly notified of such loss or damage in writing. In no case shall Douglas Products be liable for consequential or incidental damages or losses.

The terms of the Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies cannot be varied by any written or verbal statements or agreements. No employee or sales agent of Doulgas Products or the seller is authorized to vary or exceed the terms of the Warranty Disclaimer or Limitation of Remedies in any manner.

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Produced for
Douglas Products and Packaging Company
1550 East Old 210 Highway
Liberty, MO 64068-9459

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EPA accepted 11/25/15

Revisions:

1. Change company name, address, emergency number and EPA registration number.
2. Updated warranty.

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RESTRICTED USE PESTICIDE DUE TO INHALATION TOXICITY

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.



ZYTHOR

05/10/13

Use to control existing infestations of all life stages of listed pests such as drywood termites, beetles (old house borer, powderpost, deathwatch), bedbugs, clothes moths, German cockroaches and rodents (rats, mice). Use to control existing infestations of non-egg life stages only of insects such as dermestid beetles (furniture carpet, carpet) and cockroaches (oriental, American, brown-banded). Use to control existing infestations of above ground Formosan termites.

For use in disinfecting structures such as dwellings, buildings, warehouses, mobile homes. For use in disinfecting vehicles such as automobiles, buses, recreational vehicles, surface ships, shipping containers, rail cars, (except aircraft). For use in disinfecting materials (construction) and furnishings (household effects).

When using, observe local, state and federal rules and regulations concerning the use of warning agents, detection devices, respiratory protection, protective clothing, security requirements and posting of warning signs.

ACTIVE INGREDIENT

Sulfuryl fluoride..... 99.3%

OTHER INGREDIENTS..... 0.7%

TOTAL..... 100.0%

KEEP OUT OF REACH OF CHILDREN

DANGER PELIGRO



POISON

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.)

In case of emergency endangering health or the environment involving ZYTHOR, call 1-800-369-4352.

Manufactured for: Ensystex II, Inc.
202 Fairway Dr, Fayetteville, NC 28305 USA

FIRST AID

In all cases of overexposure, when symptoms such as nausea, difficulty in breathing, abdominal pain, slowing of movements and speech or numbness in extremities are exhibited, get medical attention immediately. Take affected person to a doctor or emergency treatment facility.

If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible. Call a poison control center or doctor for further treatment advice.

If liquid is on skin or on clothing: Immediately apply water to contaminated area of clothing before removing. Once area has thawed, remove contaminated clothing, shoes and other items covering skin. Rinse skin immediately with plenty of water for 15-20 minutes. 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 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Liquid fumigant in the eye may cause damage due to refrigeration or freezing. Call a poison control center or doctor for treatment advice.

HOT LINE NUMBER

Have the product container or label with you when calling a poison control center or doctor, or when going for treatment. You may also call 1-800-424-9300 for emergency medical treatment information.

NOTE TO PHYSICIAN

ZYTHOR is a gas that has no warning properties such as odor, color or eye irritation. (Chloropicrin, which is used as a warning agent in conjunction with ZYTHOR, is the active ingredient in tear gas and will cause tearing.) Early symptoms of exposure to ZYTHOR 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 can result in significant lung and kidney damage. Single exposures at high concentrations have resulted in death. Treat symptomatically.

READ THIS ENTIRE LABEL BEFORE USING THIS PRODUCT. ALL PARTS OF THIS LABEL ARE EQUALLY IMPORTANT FOR SAFE AND EFFECTIVE USE OF THIS PRODUCT. AS NECESSARY, CONSULT WITH THE LEAD STATE PESTICIDE REGULATORY AGENCY TO DETERMINE OR REMAIN INFORMED OF THE CURRENT REGULATORY STATUS, REQUIREMENTS AND RESTRICTIONS CONCERNING THE USE OF THIS PRODUCT FOR FUMIGATION IN THE STATE OF INTENDED USE. CALL ENSYSTEX II, INC. (PHONE 1-866-367-8467) IF YOU HAVE ANY QUESTIONS OR DO NOT UNDERSTAND ANY PART OF THIS LABEL.

APPLICATION PERSONNEL MUST PARTICIPATE IN ENSYSTEX II'S ZYTHOR TRAINING AND STEWARDSHIP PLAN

THE ZYTHOR APPLICATOR'S MANUAL IS PART OF THE LABELING FOR ZYTHOR.

Notice: Before buying or using this product, read "Terms and Conditions of Use", "Warranty Disclaimer", "Inherent Risks of Use" and "Limitation of Remedies" sections of this label. If terms are unacceptable, return at once unopened.

EPA Reg. No. 81824-1

NET CONTENTS: See container

Zythor is a registered trademark of Ensystex II, Inc.

PRECAUTIONARY STATEMENTS

Hazards to Humans and Domestic Animals

DANGER
PELIGRO



POISON

Extremely Hazardous Liquid And Vapor Under Pressure • Fatal If Inhaled • May be Fatal if Swallowed • Causes Irreversible Eye Damage • Contact with Liquid Causes Freeze Burns Of Exposed Skin

Do not get in eyes, on skin or on clothing. ZYTHOR is odorless and colorless. Exposure to toxic levels may occur without warning or detection by the user or exposed persons.

Protective Clothing

Wear splash resistant goggles or full face shield for eye protection during introduction of fumigant or when working around any lines containing fumigant under pressure. Do not wear gloves or rubber boots. Do not reuse clothing or shoes that have become contaminated with liquid fumigant until they have been thoroughly aerated and cleaned. Splash resistant goggles are defined as goggles designed and made of material that allows no measurable movement of the liquid pesticide being used to pass through them during use.

Respiratory Protection

Use of an approved Respiratory Protection Device (see *Respiratory Protection Devices*) is required to enter or remain within a fumigated space anytime the concentration of ZYTHOR within the breathing zone of that space is known to exceed 1 ppm or is unknown, such as at the start of the aeration process. Breathing zones are defined as areas within the fumigated structure where individuals typically stand, sit or lie down.

If the concentration of ZYTHOR within the breathing zone of the fumigated space, as measured by an approved and properly calibrated Low Fumigant Level Detection Device (see *Low Fumigant Level Detection Devices*), does not exceed 1 ppm, no respiratory protection is required to enter or remain within the fumigated space. Because the approved detection devices give immediate readings of the levels of fumigant present, respiratory protection is not required when these devices are in use after the initial 1 hour aeration procedure is completed. However, whenever a fumigant level reading exceeding 1 ppm is obtained within the breathing zone of a fumigated space, anyone within the fumigated space not using an approved Respiratory Protection Device must immediately leave the fumigated space and remain outside the fumigated space until fumigant level readings of 1 ppm or greater are no longer obtained within the breathing zone of the fumigated space. The fumigated space must remain posted until cleared for re-occupancy. Refer to the Zythor Applicator's Manual for further details.

Respiratory Protection Devices

Use a NIOSH or MSHA approved positive pressure Self-Contained Breathing Apparatus (SCBA, not SCUBA) or combination air supplied/SCBA respirator, such as those manufactured by Ranger, Survivair, Scott, or MSA, when respiratory protection is required (see *Respiratory Protection*). Required Respiratory Protection Devices must be on site and operational before an application of ZYTHOR begins.

Before using any make or brand of Respiratory Protection Device, learn how to use it correctly. Determine that it is in good working order, that it has an air supply sufficient to supply air for the period of time the device will be in use, that it fits properly and that it provides an adequate seal around the face.

Low Fumigant Level Detection Devices

As part of the aeration/clearance process or cylinder leak procedure, an approved Low Fumigant Level Detection Device capable of confirming a concentration of ZYTHOR of 1 ppm or less, such as the SPECTROS SF-ExplorIR, INTERSCAN or MIRAN gas analyzers, should be used to sample the air within the breathing zone of the fumigated space to confirm the level of fumigant, if any, that is still present. The INTERSCAN gas analyzer must be calibrated within one month prior to its use as a Low Fumigant Level Detection Device. All other approved Low Fumigant Level Detection Devices must be calibrated according to their manufacturer's recommendations.

ENVIRONMENTAL HAZARDS

Sulfuryl fluoride is highly toxic to fish and wildlife. Avoid exposure to non-target organisms.

PHYSICAL AND CHEMICAL HAZARDS

Sulfuryl fluoride is a colorless, odorless, non-irritating toxic gas. ZYTHOR cylinders are under pressure and must not be stored near heat or open flame. Exposure of the cylinder(s) to temperatures above 158°F will cause a fusible plug in the valve body to melt and the contents to be released into the atmosphere. Under high heat conditions (temperatures above 752°F), ZYTHOR 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.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal. Do not ship or store with food, feed, drugs or clothing.

Pesticide Storage: Store in a dry, cool, well ventilated area under lock and key. Post as a pesticide storage area. Store cylinders upright, secured to a rack or wall to prevent tipping. Storage of ZYTHOR in occupied buildings and spaces is prohibited unless storage area(s) is equipped with either 1) a permanently mounted and properly maintained and functioning sulfuryl fluoride monitoring device designed to alert occupants of the building to the presence of sulfuryl fluoride in the air of the storage area at a level greater than 1 ppm or 2) a continuously operating forced air ventilation system that meets all applicable ordinances pertaining to the storage of hazardous materials.

Cylinder Return: Refillable container. When cylinder is empty, close valve, screw safety cap onto valve outlet and replace protection bonnet. Follow registrant's instructions for return of empty or partially empty cylinders. Only the registrant is authorized to refill cylinders. Do not use cylinders for any other purpose. Always follow the proper cylinder handling directions.

Pesticide Disposal: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide is a violation of Federal law. If the 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.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. Carefully read and follow all Directions For Use. **The Zythor Applicator's Manual is part of the labeling for Zythor.**

ZYTHOR is a highly hazardous material and must be used only by individuals trained in its proper use and knowledgeable of its possible hazards. All local, state and federal rules and regulations regarding security requirements, reentry, aeration, clearance, posting of warning signs and use of detection devices, warning agents and respiratory protection equipment must be observed when fumigating with ZYTHOR.

Do not apply this product without first computing the dose to be applied with the Fumicalc software program. The Fumicalc program, which is available from Ensystex II, Inc., is part of the labeling for this product and must be used to calculate any dose of ZYTHOR.

Two persons trained in the use of ZYTHOR, at least one of whom is an applicator licensed/certified to perform fumigations by the state in which the application is being performed, must be present on site during any release of ZYTHOR, during any reentry into the fumigated space within the exposure period and during initiation of the initial aeration procedure. Two persons, however, need not be present if monitoring is conducted remotely (outside the area being fumigated) and no one enters the fumigated space.

If fumigating for insect pests, do not apply ZYTHOR when the lowest temperature at a site of pest activity within the fumigated space is below 40°F. Generally, the lowest temperature in a slab structure is found at the slab foundation and the lowest temperature in a crawl space structure is found just below the surface of the crawl space soil. No temperature restriction applies when fumigating for rodents.

Remove, food, feed, drugs (including tobacco products) and medicinals from the structure before the fumigation if they cannot be protected against exposure to ZYTHOR (see *Preparation for Fumigation*). Chloropicrin must be used to warn of the presence of fumigant within the fumigated space (see *Warning Agent*).

Handling and Transportation of Cylinders

Cylinders must not be subjected to rough handling or mechanical shock such as dropping, bumping, dragging or sliding. Do not use rope, slings, hooks, tongs or similar devices to unload or move cylinders. Transport cylinders using a hand truck or fork truck to which the cylinder can be firmly secured. Do not transport any cylinders in closed vehicles where they occupy the same common airspace as personnel. Transport cylinders securely and only in an upright position. ZYTHOR cylinders should never be transported by aircraft under any circumstances.

Do not remove valve protection bonnet and safety cap until immediately before use. Replace safety cap and valve protection bonnet as soon as practical after use.

The cylinder valve is designed to retain a small amount of fumigant within the cylinder when the pressure within the cylinder falls below a certain pressure. This feature prevents the introduction of unauthorized substances into the cylinder when it is empty. This is facilitated by a spring loaded residual pressure feature incorporated into the valve that cuts off gas flow when the pressure of the remaining gas falls below a certain low level. Do not attempt to defeat this mechanism as serious injury could result.

Cylinder Leak Procedure

Evacuate immediate area of leak. Use an approved Respiratory Protection Device (see *Respiratory Protection Devices*) for entry into affected areas to correct the problem. Move leaking or damaged cylinder outdoors or to an isolated location, observing strict safety precautions. Work upwind from the cylinder if possible. Entry into the affected area by persons not using approved Respiratory Protection Devices is not permitted until the concentration of ZYTHOR in the breathing zone of the affected area is determined to be 1 ppm or less, as determined by an approved Low Fumigant Level Detection Device (see *Low Level Fumigant Detection Devices*). Refer to the Zythor Applicator's Manual for further details.

Compressed Gas Hazards

The release of fumigant under high pressure can be forceful, creating a potential for personal injury.

A fog-out can occur if ZYTHOR is released too rapidly. The chances of this condition occurring may be decreased by following the instructions contained in this label (see *ZYTHOR Release Preparation*).

The rapid discharge of ZYTHOR through introduction equipment will result in the cooling of parts of the equipment and the cylinders. Contact with the cooled equipment can cause frostbite.

PREPARATION FOR FUMIGATION

Structure Occupant Fact Sheet

Prior to the application of ZYTHOR to a structure, the ZYTHOR Fact Sheet must be provided to an adult occupant of the structure to be fumigated. In the case of a multi-unit or connected structure (see below), the ZYTHOR fact sheet must be provided to an adult occupant of each currently occupied individual living unit within these structures.

Fumigating Part(s) of a Structure (including Portions of a Multi-unit Structure)

When fumigating unit(s)/room(s) that are a part of or are within a larger structure (such as one or more units of a town house, apartment or condominium building/complex) the space within all units/rooms of the entire structure must be considered to be fumigated space with respect to all requirements concerning structure entrance security, posting, evacuation, reentry, aeration and clearance. Chloropicrin needs to be used only within the fumigated units/rooms of the structure. If during clearance the concentration of Zythor in the breathing zone of a unit/room is discovered to be greater than 1 ppm, ventilate the unit/room by opening operable doors and windows and continue to measure the concentration of Zythor in the breathing zone until it is 1ppm or less. Structure may be reoccupied when concentrations of Zythor in the breathing zones of all units/rooms in the structure is 1 ppm or less. Breathing zones are defined as areas within the units/rooms where individuals typically stand, sit or lie down.

Fumigating Connected Structures

A connected structure or area is defined as any structure or area connected to or having in common with the space to be fumigated any construction elements (e.g. pipes, conduits, ducts, cavities, voids, etc.) which could possibly allow the passage of fumigant out of the fumigated space into the connected structure(s) or area(s).

If state rules and regulations do not permit the continued occupancy of a structure or area connected to a structure that is being fumigated during the fumigation process, the space within the entire connected structure(s) or area(s) must be considered to be a fumigated space with respect to all requirements concerning structure entrance security, posting, evacuation, reentry, aeration and clearance. If the continued occupancy of connected structures is permitted during fumigations by state rules and regulations and continued occupancy of connected structures will occur during the fumigation process, adhere to the procedures contained within the state rules and regulations for isolating the connected structure(s) from the fumigated space before allowing for such occupation to occur. Chloropicrin needs to be used only within the fumigated space. Concentration levels of Zythor must be measured in the breathing zones in any connected structure(s) or area(s) to confirm concentrations are 1 ppm or less before the structure(s)/area(s) can be reoccupied.

What to Remove from the Fumigated Space

Remove all persons, domestic animals, pets and desirable growing plants from the space to be fumigated. Remove mattresses (except waterbeds) and pillows completely enveloped in waterproof covers or alternately remove or unseal / unzip covers.

Food, feed, drugs (including tobacco products) and medicinals (including those items in refrigerators and freezers) can remain within the fumigated space if they are contained within plastic, glass or metal containers with the original manufacturer's air-tight seal intact.

Remove fish tanks 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.

Protective Bagging of Open Food, Feed and Drugs

Food, feed, drugs (including tobacco products) and medicinals (including those items in refrigerators and freezers) not in plastic, glass or metal containers with the original manufacturer's air-tight seal intact must be removed from the fumigated space or protected against exposure to ZYTHOR if they are left within the fumigated space.

Items can be protected against exposure to ZYTHOR by double bagging them in Fumiguard, Nylofume® or Master Fume® bags. Fumiguard bags, which are available from Ensystex II (and Nylofume and Master Fume bags) are made of a material highly resistant to permeation from gases such as sulfuryl fluoride. Double bag in Fumiguard, Nylofume or Master Fume bags all items that must be protected against exposure to ZYTHOR that will be left within the fumigated space. Double bagging is performed by placing an item in a Fumiguard, Nylofume or Master Fume bag, twisting the top of the bag closed tightly and then securing the twisted part of the bag in its closed position. The closed bag is then double bagged by placing the closed bag inside another bag which is secured closed in the same manner as the inner bag.

Extinguishing Flames and Disconnecting Heat Sources

Extinguish all flames, including pilot lights of furnaces, water heaters, dryers, gas refrigerators, gas logs, ranges, ovens, broilers, open flames, etc. Turn off or unplug all electrical heating elements such as those in heaters, dryers, pianos, organs, etc. Shut off automatic switch controls for appliances and lighting systems that will be contained within the fumigated space. Contact your local gas company to determine what procedures should be followed in your area for shutting off natural gas or propane service. Gas service must be shut off at the main service valve. Sulfuryl fluoride can react with strong bases such as some photo developing solutions.

Doors and Openings to Closed Spaces

Open and leave open all operable internal doors. Open and leave open all operable openings to rooms, attics, sub-areas, storage rooms and closets. Open and leave open operable doors, covers or lids of any space within which fumigant could accumulate and linger during aeration including storage cabinets, drawers, storage chests and appliances (such as washers, dishwashers, dryers, microwave ovens, conventional ovens, refrigerators, freezers, etc.).

Appliances

Turn off and/or disconnect appliances as appropriate to the circumstances. Alternately leave refrigerators and freezers operating and their doors closed if the choice is made to leave properly sealed items inside of them. If the choice is made to leave sealed items in closed refrigerators and freezers during the exposure period, the appliance's doors must be opened and left open at some point during aeration and clearance of the fumigated space until the concentration of ZYTHOR within their interior is 1 ppm or less as measured by an approved and properly calibrated Low Fumigant Level Detection Device.

Air Circulation

Based on the circumstances, it may be necessary to actively circulate the air in all or part of the fumigated space with properly positioned fans after the release of ZYTHOR to assure its rapid dispersion within all of the fumigated space. Parts of the structure that

may warrant consideration for active air circulation may include basements, dead air spaces and areas located long distances from a point of ZYTHOR introduction into the fumigated space. If possible, position and aim fans in such a manner that air closer to the point(s) of ZYTHOR release is circulated towards points farther from the point(s) of ZYTHOR release.

Fumigant Confinement

The methods and materials used to confine the fumigant to a space to be fumigated can vary depending on the nature of the space (e.g., structure, vehicle, chamber, vessel) and the inherent resistance of the surfaces that form the space to the movement of the fumigant out of it (e.g., masonry walls vs. wood walls). The more gas tight the fumigated space inherently is or can be rendered to be, the higher the level of fumigant confinement that can be attained. Consider a monitored application of ZYTHOR (see *Monitored Vs. Un-Monitored Application*) to any fumigated space where there is uncertainty as to whether or not an adequate level of ZYTHOR can be confined to that space for the intended duration of the exposure period.

Structure Fumigation Using A Tarpaulin

When and to the extent needed, use tarpaulin(s) made of a material that effectively confines and is sufficiently impermeable to the passage of the fumigant through it such as vinyl coated nylon or polyethylene sheeting of at least 4 mil thickness to cover the structure or portion of the structure containing the space to be fumigated. Seal all seams between adjacent tarpaulins. Seal all edges of the tarpaulin that touch the ground or ground level surface to that surface with, for example, soil, sand or weighted snakes resting on the edge of the tarp. After tarping, make sure that all operable windows and interior doors of the fumigated space are open. Leave windows closed if required by local and/or state regulations.

Fumigant can be lost (and damage to plants outside the fumigated space around the exterior of a fumigated structure can occur) when it is able to penetrate the soil surface within the fumigated space adjacent to where the tarpaulins rest against the ground and move outward. This movement is retarded when the soil between the foundation of the structure and the outermost edge of the tarpaulin around the perimeter of the structure contains a high level of moisture. If soil around the foundation of the structure is not sufficiently moist to act as a barrier to fumigant movement, wet all soil between the foundation of the structure and the outermost edge of the tarpaulin around the perimeter of the structure and around the root zone of plants that may be potentially affected.

Structure Fumigation Without Using a Tarpaulin

For fumigated spaces or structures that can be adequately sealed against the excess movement of fumigant out of them without the use of a tarpaulin, seal adequately around exterior doors, windows, vents, fireplaces and other openings of the fumigated space. Use sealing materials and techniques proven to adequately retard the movement of fumigant out of a fumigated space such as tape and polyethylene sheeting. 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 to fumigant movement.

Chamber Fumigation

Fumigations with ZYTHOR may be conducted in permanent fumigation chambers enclosed within, or connected to, a larger structure. A permanent chamber is defined as a durable hard-walled structure engineered specifically for fumigation that effectively confines ZYTHOR. Monitor indoor areas around the permanent fumigation chamber for ZYTHOR concentrations with an approved and properly calibrated Low Fumigant Level Detection Device during the fumigation, especially during fumigant introduction. No one is permitted in areas where the concentration of fumigant in the air is greater than 1 ppm unless they are using an approved Respiratory Protection Device. Aerate ZYTHOR from the chamber by venting it directly to the outside of the structure using a ventilation system that does not release ZYTHOR into the structure within which the chamber is located.

Fumigation of Construction Materials, Furnishings (Household effects) Vehicles and Shipping Containers

Preparations must be as appropriate to the particular circumstances. Create a sufficiently gas tight seal that will adequately confine the fumigant to the fumigated space for the planned exposure period based on the directions for tarpaulin, non-tarpaulin and chamber fumigation above. If the sealed fumigant space is created within a larger structure (e.g., vehicle fumigated within a garage), the space within the entire structure should be considered fumigated space with respect to all requirements concerning preparation for fumigant introduction (except fumigant confinement and warning agent), structure entrance security, posting, evacuation, reentry, aeration and clearance. Stationary vehicles should be prepared and sealed following the instructions above. Vehicles, trucks, trailers, shipping containers, railcars, etc. may be fumigated with ZYTHOR, however all aeration/clearance procedures must be completed before these are transported or driven over public roads.

Fumigation of Surface Ships in Port

Surface ships in size up to and including large ocean-going ships may be fumigated with ZYTHOR to control the pests listed on this label. The applicator and the ship's captain (or owner) shall follow all applicable regulations including those contained in the Code of Federal Regulations, Title 46 – Shipping, Chapter 1 - Coast Guard, Part 147A. Except for those persons involved in the fumigation, no people, plants, or pets may be on-board during fumigation.

The person responsible for the fumigation must notify the master of the vessel, or his representative, of the requirements relating to the use of Respiratory Protection Devices and Low Fumigant Level Detection Devices. Emergency procedures, cargo ventilation, periodic monitoring, inspections and first aid measures must be discussed with and understood by the master of the vessel or his representative.

If leakage of the fumigant is detected, the person in charge of the fumigation shall take action to correct the leakage, or shall inform the master of the vessel, or his representative, when appropriate, of the leakage in order that corrective action can be taken by them.

Food, feed, drugs (including tobacco products) and medicinals shall not be exposed to the fumigant. If they are not removed from the vessel they shall be protected from exposure to the fumigant. The vessel must not be moved during the period of time between initial fumigant application and final clearance.

Approved Respiratory Protection Devices must be worn during reentry into the fumigated space when reentry occurs between the time of initial fumigant application and final clearance and a concentration of more than 1 ppm of fumigant is detected in a breathing zone of the fumigated space during that period.

Warning Agent

Chloropicrin is a warning agent that must be released within the space to be fumigated prior to introduction of ZYTHOR into that space. Even at very low levels of concentration in the air, unprotected exposure to chloropicrin in the air causes tearing and smarting of the eyes accompanied by a disagreeable, penetrating smell. Chloropicrin must be released into the fumigated space only by a Certified Applicator or someone under their direct supervision. Applicators must observe the chloropicrin precautionary statements and personal protective equipment appearing on this label, see the *Warning Agent* section of the manual.

Chloropicrin must be released within a fumigated space at least 5 minutes prior to introduction of the fumigant. Apply/release 1 fluid oz of chloropicrin per 10,000 to 15,000 cubic feet – (30 ml of chloropicrin per 283 to 425 cubic meters) of fumigated space or alternately use the chloropicrin dosage rate calculated by the Fumicalc program for the fumigated space. Establish at least one chloropicrin introduction site for each 45,000 cubic feet (1275 cubic meters) of fumigated space. When applying chloropicrin at multiple chloropicrin introduction points within a structure, start at the point farthest from the exit and work toward the exit. Dispense no more than 3 fluid ounces (90 ml) of chloropicrin into a single evaporation container. Distribution of chloropicrin throughout a fumigated space is enhanced by applying/releasing it as follows:

1. Place a shallow, wide container directly behind a fan in its air stream.
2. Place a handful of wicking agent, (e.g., cotton) in the bottom of the container.
3. Pour the chloropicrin over the wicking agent.

Do not place chloropicrin into a container made of magnesium, aluminum, or their alloys, as chloropicrin may severely corrode these metals. Removal of all chloropicrin evaporation containers from the fumigated space as soon as possible after commencement of the initial aeration procedure will speed dissipation of the chloropicrin from the fumigated space.

The use of chloropicrin is not required when fumigating railcars and shipping containers; however if chloropicrin is not used, a thorough pre-fumigation walk-through inspection must be performed of each railcar or shipping container with their doors being immediately locked upon leaving each car or container. A guard must be continuously posted during the period between ZYTHOR introduction and final clearance if no chloropicrin is used.

Securing Fumigated Structure Entrances

During the Exposure Period and Step 2 of the aeration procedures, fumigated structure(s) must be secured against the possibility of entry into the structure(s) by anyone other than a Certified Applicator or persons under their direct supervision. Two levels of security against unauthorized entry must be employed at each exterior entrance during those periods, if practicable. In addition to the use of existing locking mechanisms, if present, a secondary locking device must also be used. 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 or the fumigation or persons under his/her direct supervision. Consult state and local regulations for any supplementary instructions and/or restrictions on securing against unauthorized entry into fumigated structures.

Posting of Fumigated Spaces

All entrances and all sides of the fumigated space including those within structures, chambers, vehicles, ships and stacks must be posted and placarded with warning signs. Signs must remain legible during the entire posting period. Post warning signs in advance of the fumigation in order to keep unauthorized persons away. All signs must bear the following in English and Spanish:

1. The signal word "DANGER/PELIGRO" and the SKULL and CROSSBONES symbol in red.
2. The statement, "Area under fumigation, DO NOT ENTER/NO ENTRE".
3. The date of the fumigation.
4. Name and EPA Registration Number of the fumigant.
5. Name, address, and telephone number of the fumigation company and the licensed/certified applicator.

Only a certified applicator may authorize removal of the signs and only when the concentration of Zythor within the structure where individuals typically stand, sit or lie down (breathing zone) is 1 ppm or less.

DETERMINING DOSES AND EXPOSURE PERIODS FOR ZYTHOR

The amount of ZYTHOR applied to the fumigated space is referred to as the dose. The level of fumigant present in the air is referred to as the concentration. Dose is expressed in pounds of fumigant and concentration is expressed in ounces of ZYTHOR per thousand cubic feet of fumigated space. Achieving target pest mortality with ZYTHOR is dependent upon the concentration of ZYTHOR present in the air the target pest is breathing. However, it is also dependent upon the length of the period of time the target pest is exposed to that concentration (exposure period) and the temperature. For a given temperature and rate of ZYTHOR loss from the fumigant space, increases in the concentration of ZYTHOR can reduce the length of the exposure period required to kill a pest. Conversely, under the same temperature and rate of fumigant loss conditions, increases in the length of the exposure period can reduce the concentration of ZYTHOR required to kill the same pest. Concentration in ounces per thousand cubic feet multiplied by the number of hours in the exposure period is referred to as the Kill Power Index.

The Fumicalc computer program, designed to run on most types of desktop and laptop computers and many handheld computers, is used to calculate the Kill Power Index that must be achieved within a fumigant space to kill the target pest and the dose and exposure period necessary to achieve that Kill Power Index. The Fumicalc program is part of the ZYTHOR labeling and must be used to calculate all doses and exposure periods for ZYTHOR. The Fumicalc accepts as inputs the factors necessary to compute these values for all labeled target pests. The Fumicalc program is available from Ensystex II, Inc.

Certain insects are more susceptible to exposure to ZYTHOR than others. This means higher Kill Power Indexes must be achieved for certain Target Pests compared to that needed to kill others. Higher Kill Power Indexes can be achieved for any fumigated space by administering a higher Concentration of ZYTHOR and/or extending the Exposure Period, all of which is handled by the Fumicalc automatically. All you have to do is tell the Fumicalc the Target Pest and it makes any necessary adjustments to the Kill Power Index.

The egg stage of some Target Pests are not susceptible to sulfuryl fluoride and thus cannot be killed by ZYTHOR. In this case it may be advisable to fumigate once at a concentration sufficient to control the post-embryonic (larva, pupa, adult) stages. After any surviving insect eggs have hatched, but prior to these insects' maturation and deposition of new eggs, fumigate a second time, again at the post-embryonic life stage concentration.

The Kill Power Index necessary to control different target pests is expressed in the following table as multiples of the Kill Power Index required to kill Drywood termites (Index = 1), assuming the applications occurred under the same conditions. When the egg stage of a Target Pest cannot be killed with ZYTHOR, the multiple of the Drywood Termite Kill Power Index that must be achieved to kill the non-egg stages only is given instead. These multiples apply to the use of ZYTHOR within all types of fumigated spaces.

Refer to the Zythor Applicator's Manual for further details.

Kill Power Indexes for Different Pests (Drywood Termite Index = 1)

Pests	Multiple of the Drywood Termite Kill Power Index	Comments
Rodents ¹	1/2x	
Carpet Beetles	1x	Eggs are not killed
Cockroaches (except German) ¹	1x	Eggs are not killed
Cockroach (German) ¹	1x	
Furniture Carpet Beetles	3x	Eggs are not killed
Bedbugs	3x	
Old House Borers	4x	
Formosan Termites	4x	Above ground termites only are killed. Use in combination with other methods to kill infestations originating below ground.
Clothes Moths	6x	
Powder Post Beetles and Death Watch Beetles	10x	
¹ Do not use less than the specified dosage factors when treating for rodents, cockroaches, bedbugs, and termites.		

MONITORED VS. UNMONITORED APPLICATION

Monitor or monitoring refers to the periodic measurement of the actual concentration of ZYTHOR contained within the air of the fumigated space. Monitoring confirms the concentration of ZYTHOR to which the Target Pest is exposed and allows for correction of variations of the actual from the expected concentration of ZYTHOR, if necessary. Monitoring can increase the accuracy with which the needed Kill Power Index is applied and is particularly recommended when a high level of precision is necessary. A monitored or unmonitored application of ZYTHOR can be made to any fumigated space for the control of any type of Target Pest. The ZYTHOR Fumicalc calculator is designed to calculate the dose of ZYTHOR (and supplements to the dose during the course of the fumigation in the case of a monitored application, if needed) for any fumigated space for both monitored and unmonitored applications.

ZYTHOR RELEASE PREPARATION

Prepare to release the ZYTHOR through a shooting tube to be attached to the ZYTHOR cylinder whose discharge end is positioned within the fumigated space. The system for introduction of ZYTHOR into the fumigated space (tubing, connectors, etc.) should be free of leaks and designed to withstand a minimum burst pressure of 500 pounds per square inch (psi).

If monitoring will occur, run gas sampling lines from representative locations within the fumigated space to exterior monitoring points before ZYTHOR introduction.

Preventing Fogouts

ZYTHOR is packaged as a liquid under pressure. When it is released into the fumigated space it must be converted into a gas to be effective as a fumigant. This process of release and conversion, if not properly prepared for and controlled, can result in damage to surfaces within the fumigated space from contact with water condensed from the air as the liquid to gas conversion process cools the air into which the fumigant is introduced and nearby surfaces. Damage can also occur when unconverted liquid fumigant, possibly present in the fumigated space after it is released but before it converts to a gas, comes into contact with surfaces that might be damaged by its presence.

The conversion of ZYTHOR from a liquid in the cylinder to a gas requires a source of heat. The heat to make this conversion is taken from the air into which the ZYTHOR is released as it contacts the air. The need for heat to make this conversion can cause problems when the release of fumigant removes enough heat from the air to cause the air temperature to drop below its Dew Point temperature. The amount of moisture a parcel of air can hold is dependent upon its temperature. The Dew Point temperature for a parcel of air is the temperature at which that air is holding as much moisture as it can hold. If the temperature of air falls below its Dew Point temperature, fog can form and moisture can condense from the air onto nearby surfaces if the temperature of these surfaces is low enough. The higher the percent relative humidity and the lower the temperature of surfaces in the fumigated space before the introduction of fumigant, the greater the chance fog will form in the air and/or condensation will form on surfaces.

Condensation can damage surfaces it forms on if they are sensitive to the presence of moisture.

The conversion of the fumigant from liquid to gas normally occurs almost instantaneously when it is released into the fumigated space, however it is possible that, based on the circumstances, some fumigant will remain in its liquid form for a short period of time after it has been released. This can be a problem if this super-cooled liquid fumigant is deposited onto surfaces that can be damaged by its presence, however brief.

Care must be taken to reduce the chances that moisture is condensed from the air within the fumigated space during fumigant application or that unconverted liquid fumigant is present within the fumigant space long enough to come to rest on surfaces. One way to accomplish both of these is to maximize the amount of air into which the fumigant is released. The greater the number of "units" of air used to vaporize each "unit" of fumigant, the less heat that must be removed from each "unit" of air during the conversion process. This reduces the possibility that the capacity of the air into which the fumigant is released to hold water or fumigant will be exceeded. Increase the volume of air into which the fumigant is released, and thereby maximize the rate of fumigant vaporization from liquid to gas, by situating the discharge end of the fumigant shooting tube on the positive pressure side of an operating fan (blast side) located within a large open area of the fumigated space. The air movement capacity of the fan should be at least 1,000 cubic feet per minute for each pound of ZYTHOR released per minute.

Using a small inside diameter shooting tube (1/8 inch) can also reduce the chances of un-vaporized fumigant coming to rest on surfaces within the fumigated space. To further protect against the effects of un-vaporized fumigant on surfaces, it is recommended that protective sheeting, such as polyethylene plastic, be placed on the floors in the vicinity of any fumigant release point. **In order to prevent damage, do not apply fumigant directly to any surface.**

Special care must be taken when the percent relative humidity of the air within the fumigated space is high (the amount of moisture in the air is high compared to the total amount it can hold). If necessary delay the fumigation until conditions are more favorable such as when the relative humidity within the structure to be fumigated is lower.

ZYTHOR RELEASE

Before introducing the fumigant, verify that all required safety equipment is available and in good working order. Position the ZYTHOR cylinder(s) outside the space to be fumigated. Do not connect cylinders to introduction equipment until all fumigation warning signs have been posted and the space to be fumigated is clear of persons, non-target animals and is properly secured.

Release the ZYTHOR from outside the fumigated space. Wear splash resistant goggles or full face shield for eye protection during introduction of fumigant or when working around any lines containing fumigant under pressure. Do not wear gloves or rubber boots.

AERATION AND CLEARANCE

Aeration

The final step in using ZYTHOR is to remove it from within the fumigated space (aeration) and to confirm its absence from the breathing zone of the fumigated space after the completion of the aeration process (clearance). Aeration of ZYTHOR from a fumigated space involves actively exhausting and/or allowing the ZYTHOR to dissipate from the fumigated space out into the atmosphere. Clearance involves sampling the air within the breathing zone of the fumigated space with an approved and properly calibrated Low Fumigant Level Detection Device until readings given by the detection device indicate that fumigant is no longer present above 1 ppm within the breathing zone of the fumigated space. Only when certain periods of time (see *Aeration Procedures* below) have elapsed after the initiation of the aeration process and the level of fumigant remaining within the breathing zone of the fumigated space is confirmed at the end of those time periods to no longer exceed 1 ppm can final clearance for re-occupancy be given. Breathing zones are defined as areas within the structure where individuals typically stand, sit or lie down.

Special attention must be given to aerating attics and forced air handling system ducts. Active aeration of attics can be accomplished by directing a fan into attic access openings. Air handling systems can be aerated by activating the system blower or alternately directing a fan into one or more return vents.

Refer to the Zythor Applicator's Manual for further details.

Respiratory Protection Requirements During Aeration and Clearance

The processes of aeration and clearance of the fumigated space require entry into the fumigated space while the level of ZYTHOR in the air within the breathing zone of the fumigated space still exceeds 1 ppm. All persons entering and/or remaining inside the fumigated space between the time of initial application of ZYTHOR to the fumigated space and final clearance of the fumigated space must adhere to the requirements of the *Respiratory Protection*, *Respiratory Protection Devices* and *Low Fumigant Level Detection Devices* sections of this label.

Aeration Procedures

There are two approved procedures for aeration. The aeration procedure used for a fumigated space is based on the total amount of ZYTHOR per thousand cubic feet that was released within the fumigated space during the exposure period. All structures into which a total of more than 16 ounces of ZYTHOR per thousand cubic feet of fumigated space has been released during the Exposure Period must be aerated using Aeration Procedure 2. All other fumigated spaces can be aerated using either Aeration Procedure 1 or Aeration Procedure 2.

Aeration Procedure 1 – Applied Dose 16 oz/1000 cubic feet or less

These steps must be completed in sequence.

Step (1): Aerate the fumigated space with all operable windows and doors open, aided by the use of 1 or more fans, for a minimum of 1 hour. All of the fans used shall, in total, be capable of displacing at least 5,000 cubic feet of air per minute. The fans may be turned off for the remainder of the aeration period if desired.

Step (2): Secure fumigated space and do not allow reentry for a minimum of 6 hours from the start of the aeration process (first opening of the seal). During this time, the fumigated space must remain posted.

Step (3): After the minimum 6 hour waiting period, measure the concentration of ZYTHOR in the breathing zone of each room of the fumigated space using an approved and properly calibrated Low Fumigant Level Detection Device. If a concentration of ZYTHOR greater than 1 ppm is detected in the breathing zone, ventilate the fumigated space by opening operable doors and windows and continue to measure the concentration of Zythor in the breathing zone until it is 1 ppm or less. Fumigated space may be cleared for re-occupancy when the concentration of ZYTHOR as measured with an approved and properly calibrated Low Fumigant Level Detection Device is determined to be 1 ppm or less in the breathing zone.

Aeration Procedure 2 – Applied Dose More Than 16 oz/1000 cubic feet

These steps must be completed in sequence.

Step (1): Aerate the fumigated space with all operable windows and doors open, aided by the use of 1 or more fans, for a minimum of 1 hour. All of the fans used shall, in total, be capable of displacing at least 5,000 cubic feet of air per minute. The fans may be turned off for the remainder of the aeration period if desired.

Step (2): Secure the fumigated space and do not allow reentry for a minimum of 8 hours from the start of the aeration process (first opening of the seal). During this time, the fumigated space must remain posted.

Step (3): After the minimum 8 hour waiting period, measure the concentration of ZYTHOR in the breathing zone of each room of the fumigated space using an approved and properly calibrated Low Fumigant Level Detection Device. If a concentration of ZYTHOR greater than 1 ppm is detected in the breathing zone, ventilate the fumigated space by opening operable doors and window and continue to measure the concentration of Zythor in the breathing zone until it is 1 ppm or less. Fumigated space may be cleared for re-occupancy when the concentration of ZYTHOR as measured with an approved and properly calibrated Low Fumigant Level Detection Device is determined to be 1 ppm or less in the breathing zone.

Final Clearance and Re-occupancy

Do not reoccupy fumigated space, i.e., structure, ship, vehicle or chamber, or move fumigated vehicles until aeration is complete and clearance has been given. Warning signs must remain posted until aeration is completed and final clearance for re-occupancy is given.

TERMS AND CONDITIONS OF USE

If terms of the following Warranty Disclaimer, Inherent Risks of Use or Limitation of Remedies are not acceptable, return unopened package at once to the seller for a full refund of the purchase price paid. Otherwise, use by the buyer or any other user constitutes acceptance of the terms under Warranty Disclaimer, Inherent Risks of Use and Limitation of Remedies.

WARRANTY DISCLAIMER

ENSYSTEX II warrants that this product conforms to the chemical description on the label and that it is reasonably fit for the purposes stated on the label when used in strict accordance with the directions for use, subject to the inherent risks set forth below. **TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, ENSYSTEX II MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.**

INHERENT RISKS OF USE

It is impossible to eliminate all risks associated with use of this product. Lack of performance or other unintended consequences may result because of factors such as use of the product contrary to the label directions or contrary to the dosage and/or exposure period recommendations of the Fumicalc, adverse conditions (such as unfavorable temperatures, high humidity, unfavorable soil conditions, excessive rainfall, etc.), abnormal conditions (such as excessive winds, tornadoes, hurricanes), presence of other materials, the manner of application or other factors, all of which are beyond the control of ENSYSTEX II or the seller. All such risks shall be assumed by the Buyer and User.

LIMITATION OF REMEDIES

To the extent consistent with applicable law, the exclusive remedy for losses or damages resulting from the use of this product (including claims based on contract, negligence, strict liability or other legal theories), shall be limited to, at ENSYSTEX II's election, one of the following: Refund of purchase price paid by the buyer or user for product bought or replacement of amount of product used.

ENSYSTEX II shall not be liable for losses or damages resulting from handling or use of this product unless ENSYSTEX II is promptly notified of such loss or damage in writing. In no case shall ENSYSTEX II be liable for consequential or incidental damages or losses even if ENSYSTEX II knew of, was advised of, or should have been aware of the possibility of such damages.

The terms of the Terms and Conditions of Use, Warranty Disclaimer, Inherent Risks of Use and this Limitation of Remedies cannot be varied by any written or verbal statements or agreements. No employee or sales agent of ENSYSTEX II or the seller is authorized to vary or exceed the terms of the Warranty Disclaimer or this Limitation of Remedies in any manner.

Nylofume® is a registered trademark of Dow AgroSciences, LLC.

Zythor is a registered trademark of Ensystex II, Inc.

Revised 05/10/2013

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**DOUGLAS
PRODUCTS**
Chloropicrin
Warning Agent

For Non-Pesticidal Use Only

For use only with Vikane® specialty gas fumigant. Not for use with any other structural gas fumigant.

NOTE: Chloropicrin Warning Agent is a highly hazardous material and must be handled only by individuals trained in its proper use. Consult Douglas Products for correct procedures before using.

Active Ingredient	
Chloropicrin.....	99.5%
Other ingredients.....	0.5%
Total.....	100%
Contains 13.7 pounds of chloropicrin per gallon.	

Keep Out of Reach of Children

**DANGER
PELIGRO**



POISON

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.)

IN ALL CASES OF OVEREXPOSURE, GET MEDICAL ATTENTION IMMEDIATELY BY TRANSPORTING TO AN EMERGENCY TREATMENT FACILITY.

PRECAUTIONARY STATEMENTS

Hazards to Humans and Domestic Animals

DANGER

Causes Severe Burns of Eye or Skin. May be Fatal if Absorbed Through the Skin. Causes Severe Burns of Mouth and Throat if Swallowed. May be Fatal if Inhaled. May Cause Severe Allergic Respiratory Reaction. High Concentration Can Cause Lung Injury.

Do not get in eyes, on skin or on clothing. Avoid breathing gas / vapor. Do not take internally. Avoid prolonged or repeated respiratory contact. Use only with adequate ventilation. Wash thoroughly after handling.

Personal Protective Equipment (PPE)

The following Personal Protective Equipment must be worn when handling and dispensing chloropicrin:

- Long-sleeved shirt and long pants.
- Chemical-resistant gloves. Some materials that are chemical-resistant to this product are nitrile and butyl. For more options, follow the instructions for Category F on the chemical-resistance category selection chart.
- Protective eyewear or face shield. Do NOT wear goggles.
- Respiratory Protection: When air concentrations exceed a level of 0.1 ppm, wear 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. 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.

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 further 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 the eye. Call a poison control center or doctor for further treatment advice.

If Swallowed: Call a poison control center or doctor for further treatment advice. Have the 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.

Chemical Hazard

Chloropicrin is severely corrosive of metal containers made of magnesium, aluminum, or their alloys.

DIRECTIONS FOR USE

STORAGE AND HANDLING

Storage: Store upright in a cool, dry, well-ventilated area under lock and key. Store only in original container. Do not contaminate water, food or feed by storage or disposal.

Spill and Leak Procedures: Evacuate immediate area of spill or leak. Use a self-contained breathing apparatus (SCBA) for entry into affected area to correct the problem. Move the leaking or damaged containers outdoors or to an isolated location, observing strict safety precautions. Work upwind if possible. Allow spilled material to evaporate, or absorb onto vermiculite, dry sand, earth or similar absorbent material. Thoroughly aerate absorbent materials outdoors prior to disposing on site or at an approved disposal facility. Do not permit entry into spill area or cleanup area by unprotected persons until the concentration of chloropicrin is determined to be less than 0.1 ppm.

Disposal: Allow empty container to aerate with cap off within the fumigated space during fumigation. The location should be close to a fan and/or Chloropicrin introduction site. Replace cap. Dispose of container, after it has been aerated inside of the fumigated space, in a sanitary landfill or by other approved state and local procedures.

Chloropicrin is a warning agent introduced into the structure prior to fumigation with Vikane® specialty gas fumigant. In order to avoid direct exposure to the fumigant being released, chloropicrin must be released within the structure at least 5 to 10 minutes prior to introduction of the fumigant.

Place a handful of wicking agent (e.g., cotton) in a shallow chloropicrin evaporation container. Do not use containers or application equipment made of magnesium, aluminum or other alloys as chloropicrin may be severely corrosive to such metals. To enhance the distribution of chloropicrin throughout the structure, place the shallow chloropicrin evaporation container in the air stream of a fan. Pour chloropicrin over the wicking agent. When adding chloropicrin to evaporation containers, dispense no more than 3 fluid ounces per container. Use 1 fluid ounce per 10,000 to 15,000 cubic feet (30 mL per 283 to 425 cubic meters) of space to be fumigated or follow dosage rate calculated by the electronic Fumiguide™ system. Use at least one chloropicrin introduction site for each 45,000 cubic feet of space to be fumigated. When applying chloropicrin at multiple chloropicrin introduction points within a structure, start at the point farthest from the exit and work toward the exit.

Removal of all chloropicrin evaporation containers from the fumigated space during the initial phase of aeration after tarp removal will aid in the dissipation of the warning agent from the structure.

TERMS AND CONDITIONS OF USE

If terms of the following Conditions of Sale and Limitations of Warranty and Liability are not acceptable, return unopened package at once to the seller for a full refund of purchase price paid. Otherwise, use by the buyer or any other user constitutes acceptance of the terms under the Conditions of Sale and Limitations of Warranty and Liability.

CONDITIONS OF SALE AND LIMITATIONS OF WARRANTY AND LIABILITY

Read the entire directions for use, conditions of warranties and limitations of liability before using this product. If terms are not acceptable, return the unopened product container at once. By using this product, user or buyer accepts the following Conditions, Disclaimer of Warranties, and Limitations of Liability.

The directions for use of this product are believed to be adequate and must be followed carefully. However, it is impossible to eliminate all risks associated with the use of this product. Ineffectiveness or other unintended consequences may result because of such factors as presence of other materials, or the manner of use or application, all of which are beyond the control of Douglas Products and Packaging. All such risks shall be assumed by the user or buyer.

To the extent consistent with applicable law, Douglas Products and Packaging makes no other warranties, express or implied, of merchantability or of fitness for a particular purpose or otherwise, that extend beyond the statements made on this label. No agent of Douglas Products and Packaging is authorized to make any warranties beyond those contained herein or to modify the warranties contained herein. To the extent consistent with applicable law, Douglas Products and Packaging disclaims any liability whatsoever for special, incidental or consequential damages resulting from the use or handling of this product.

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**Produced for
Douglas Products and Packaging Company, LLC
1550 East Old 210 Highway
Liberty, MO 64068
800-223-3684**

Label Version: 2.0 (3/1/2017)

LACRYTHOR

FUMIGATION WARNING AGENT

PRECAUTIONARY STATEMENTS HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER

KEEP OUT OF REACH OF CHILDREN

Causes severe burns of eye or skin. May be fatal if absorbed through the skin. Causes severe burns of mouth and throat if swallowed. May be fatal if inhaled. May cause severe allergic respiratory reaction. High concentrations can cause lung injury. Do not get in eyes, on skin or on clothing. Avoid breathing gas/vapor. Do not take internally. Avoid prolonged or repeated respiratory contact. Use only with adequate ventilation. Wash thoroughly after handling.

- Use product only with adequate ventilation and avoid breathing chloropicrin vapors. Do not get in eyes, on skin or on clothing.

Upon contact with the skin or eyes, chloropicrin causes severe burns and may be fatal if absorbed through the skin. Wash

thoroughly after handling.

- Do not take internally. Causes severe burns of the mouth and throat if swallowed.
- Because chloropicrin has a disagreeable, penetrating smell, exposure to hazardous levels cannot be voluntarily tolerated.

However, unprotected exposure to chloropicrin, even at very low levels of concentration in the air, causes tearing of the eyes.

- Inhalation may cause severe allergic respiratory reaction. Exposure to a high air concentration can cause lung injury or death.

Active Ingredient (Warning Agent):	By Wt.
Chloropicrin.....	99.5%
Other Ingredients.....	0.5%
TOTAL.....	100.0%

Net Contents: 3.5 pounds

This product weighs 13.7 pounds per gallon.

3.5 pounds = 32.7 fluid ounces

DANGER



POISON

PELIGRO

This product is a highly hazardous material and must be handled only by individuals trained in its proper use. Consult Ensystex II for correct procedures before using (1-866-367-8467). Read and follow label directions. See attached Directions For Use for more complete information.

PELIGRO: 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.) In all cases of overexposure, get medical attention immediately. Transport overexposed persons to an emergency treatment facility.

Not for use as a pesticide. For use only as a warning agent in conjunction with the use of Zythor Fumigant. This product can be used only by applicators certified to use Zythor or persons under their direct supervision. Consult Ensystex II for correct use and handling procedures.

Storage and Handling

Storage: Store cylinders upright, in a cool, dry, well-ventilated area, under lock and key. Store product only in original container. Do not contaminate water, food, or feed by storage or disposal of this product.

Spill and Leak Procedures: Evacuate spill site immediately. Equip a self-contained breathing apparatus (SCBA) prior to entry of the spill site. Move the leaking or damaged containers outdoors or to an isolated location, working upwind if possible. Allow spilled material to evaporate, or absorb onto vermiculite, sand, or other granular absorbent material. Thoroughly aerate all affected materials outdoors prior to disposal being sure to follow approved state and local procedures. Do not permit entry into spill area or cleanup area by unprotected persons until the concentration of Lacrythor is determined to be less than 0.1 ppm.

Disposal: Allow the empty container to aerate with lid off inside the area being fumigated. The container should be placed near the Lacrythor use site or fan. Once the fumigation has been completed, replace the Lacrythor container lid and dispose by following approved state and local procedures.

No Reuse: Cylinders should never be refilled by consumer or used for any other product or purpose.

Shipping of Cylinders: The material in this cylinder is classified in the U.S. Department of Transportation Hazardous Materials Regulations as Chloropicrin, 6.1, UN 1580, PG I, Poison-Inhalation Hazard, Hazard Zone B. Describe empty cylinders as having last contained Chloropicrin (Inhalation Hazard). Do not ship with food, feed, or clothing.

Personal Protective Equipment

The following personal protective equipment must be worn when handling chloropicrin:

- Long-sleeved shirt and long pants
- Chemical-resistant gloves (such as barrier laminate, neoprene rubber or viton - all 14 mils or greater. For more options follow category H on the chemical resistance category selection chart).
- Splash-resistant protective eyewear or face shield (Do NOT wear goggles).
- Persons applying chloropicrin at more than two introduction points must wear either a positive pressure self-contained

breathing apparatus or a combination air-supplied/SCBA.

Ensystex II, Inc. Fayetteville, NC - Telephone 1-866-367-8467
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Sections of 5E-14 pertaining to fumigation – All sections of 5E-14 shall be understood before examination

FLORIDA ADMINISTRATIVE CODE: CHAPTER 5E-14: ENTOMOLOGY – PEST CONTROL REGULATIONS

PART I PUBLIC HEALTH AND SAFETY

5E-14.102 Definitions.

In addition to those terms contained in section 482.021, F.S., the following terms shall mean:

- (1) “Application of fumigant(s)” – Release of fumigant(s) into structure or enclosed space.
- (2) “Fumigation operation” – All details before application of fumigant(s), the application of fumigant(s), fumigation period and post fumigation details as herein outlined.
- (3) “Fumigation period” – Period of time from application of fumigant(s) until the ventilation of structure is completed, and the structure is declared safe for occupancy.
- (4) “General fumigation” – Application of fumigant(s) to one (1) or more rooms or their contents in a structure or to entire structure; or to commodities under gas-tight sheets or tarpaulins.
- (5) “Preventive treatment” – Application of measures for the purpose of preventing infestation(s) or infection(s) of structures by wood-infesting organisms.
- (6) “Residential area” – Any area other than an agricultural area or as otherwise specifically exempted by chapter 482, F.S.
- (7) “Spot fumigation” – Application of fumigant to localized harborage or infestation within, on or under a structure or enclosed space, or to a lawn under tarpaulins.
- (8) “Spot treatment” – Treatment restricted to specific area(s) of a structure to control or prevent pests.
- (9) “Multi-Unit structure” – A structure, consisting of one or more stories, composed of functionally distinct units, such as stores, offices, apartments, townhouses, and condominiums, in which units share a common wall of wood or metal studs or single masonry walls, including fire walls.
- (10) “Classroom” – A student or students studying a subject in a setting conducive to learning, other than field training as required by section 482.091(3), F.S., with an instructor or other multimedia instructional tools, computer instruction, or correspondence courses.
- (11) “Multi-unit dwelling” is defined as a multi-unit structure whose primary function is to serve as living quarters for people, such as apartment buildings, condominiums, duplexes, and townhomes.
- (12) “Direct Supervision” requires the personal presence of either the certified fumigation operator or his or her special fumigation identification cardholder at the fumigation job site.
- (13) “Breathing Zone” is defined as the area of space in each room of a fumigated structure where persons typically stand, sit, or lie down.
- (14) “Secondary Locking Device” is defined as any device, method or barricade, in addition to existing locking mechanisms, that is demonstratively effective in preventing an exterior door or entrance from being opened or entered by normal means by anyone other than the certified operator in charge or his special fumigation identification cardholder.
- (15) “Barricade and Barring” secures the entrances to a structure against unauthorized entry during the fumigation exposure period and must be demonstratively effective in preventing an exterior door or doorway from being opened from the exterior.
- (16) “Access device” as used in subsection 5E-14.108(5), F.A.C., is defined as a lockbox or other onsite device that stores the key or controls access, either physically or electronically, to the fumigated structure. This is not a secondary locking device.
- (17) “Connected Structure” is defined as any structure physically connected with the structure to be fumigated by construction elements (e.g. pipes, conduits, drains, ducts, etc.), which may allow passage of fumigant between the structures.
- (18) “Stewardship Policy” means a written plan that addresses the education and training of all fumigation

employees and includes requirements for continued sale and use of the registrant's residential fumigant, instructions to follow the residential fumigant's label requirements and submission to quality assurance inspections conducted by the registrant or designated representative such as distributors and contractors.

(19) "Fumigation Employee" means any of the following persons who is an employee of a licensee or a person conducting fumigation at the direction of or under the control of a licensee:

- (a) Certified Operators in the fumigation category;
- (b) Special Identification Cardholders;
- (c) Employee Identification Cardholders with the Fumigation Identification Card endorsement.

(20) "Residential Fumigant" means a registered pesticide labeled for structural fumigation including or encompassing a residential area in the state of Florida.

Rulemaking Authority 482.051, 570.07(23) FS. Law Implemented 482.021, 482.051 FS. History—New 1-1-77, Amended 6-27-79, 6-22-83, Formerly 10D-55.102, Amended 8-11-93, 6-12-02, 4-17-03, 9-17-08, 5-7-17.

5E-14.1025 Inspections and Investigations.

(1) The department will conduct routine inspections or for cause investigations of licensees, certified operators, special identification cardholders, employee identification cardholders, all limited certificate holders, and any other person, pursuant to Section 482.061, F.S., in order to ensure:

- (a) The protection of the health, safety, and welfare of pest control employees and the general public.
- (b) Compliance with chapter 482, F.S., and chapter 5E-14, F.A.C.

(2) The following forms will be used in department inspections and investigations. Copies of these forms may be obtained from the department's Bureau of Inspection and Incident Response, 3125 Conner Boulevard, Suite N, Tallahassee, Florida 32399-1650 or online as provided below.

(a) Fumigation Inspection Report, (FDACS-13629, Rev. 10/15), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07284>.

(b) Licensee Inspection Pest Control Business, (FDACS-13630, Rev. 10/15), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07285>.

(c) Notice of Inspection Pest Control Business, (FDACS-13633, Rev. 09/16), which is hereby adopted and incorporated by reference and available online at <http://www.flrules.org/Gateway/reference.asp?No=Ref-07286>.

(d) Notice of Inspection Pest Control Service Vehicle Inspection, (FDACS-13655, Rev. 10/15), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07287>.

(e) Notice of Inspection, (FDACS-13656, Rev. 10/15), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07288>.

(f) Affidavit – Pretreatment, (FDACS-13658, Rev. 10/15), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07290>.

(g) Affidavit, (FDACS-13661, Rev. 09/16), which is hereby adopted and incorporated by reference and available online at <http://www.flrules.org/Gateway/reference.asp?No=Ref-07291>.

(h) Licensee Inspection Termites and Other Wood-Destroying Organisms Category, (FDACS-13672, Rev. 09/16), which is hereby adopted and incorporated by reference and available online at <http://www.flrules.org/Gateway/reference.asp?No=Ref-07292>.

(i) Licensee Inspection Pesticide Product Review, (FDACS-13673, Rev. 09/16), which is hereby adopted and incorporated by reference and available online at <http://www.flrules.org/Gateway/reference.asp?No=Ref-07293>.

(j) Licensee Inspection Fumigation Category, (FDACS-13674, Rev. 09/16), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07616>.

(k) Field Advisory Notice, (FDACS-13675, Rev. 10/15), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07295>.

(l) Notice of Inspection Limited Certification Commercial Landscape Maintenance Inspection, (FDACS-13676, Rev. 10/15), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07296>.

(m) Request for Investigation, (FDACS-13621, Rev. 10/15), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07297>.

(n) Report of Investigation, (FDACS-13640, Rev. 10/15), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07298>.

(o) Request for Inclusion on AHB Bee Eradication or Removal List, (FDACS-13689, Rev. 10/15), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07299>.

(p) Company Response to Consumer Allegation, (FDACS-13620, Rev.10/15), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07300>.

(q) Request for Information, (FDACS-13678, Rev. 10/15), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07301>.

(r) Illegal/Unlicensed Pest Control Operations Report Form, (FDACS-13687, Rev. 10/15), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07302>.

(s) Pesticide Sample Collection Report, (FDACS-13234, Rev. 10/15), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07303>.

Rulemaking Authority 482.051, 570.07(22), 570.07(23) FS. Law Implemented 482.032, 482.051, 482.061 FS. History--New 1-9-17.

5E-14.103 Licensee Identification – Vehicles, Equipment.

To assist the Department in enforcement of chapter 482, F.S., and all regulations thereunder, the licensee shall identify all units or equipment used by him or in his behalf for pest control as follows:

(1) All motor vehicles and all trailers used in behalf of or by any licensee or licensee's employees in the conduct of pest control shall be marked for easy identification with the licensee's name or trade name, as registered with the Department. Vehicles shall be permanently marked except as provided below. The term "permanently marked" shall mean paint or decals applied to the vehicle body itself. Only those vehicles used exclusively for the purpose of sales and soliciting of business may be temporarily marked, including the use of magnetic signs, provided that no pesticides or pesticide application equipment are carried in the vehicle. All vehicles used in the conduct of pest control that carry or contain pesticides or pesticide application equipment, shall be permanently marked.

(2) The licensee's name or trade name shall appear conspicuously on both sides of each motor vehicle and each trailer, and shall be in bold lettering at least one and one-half (1 1/2) inches high, distinctly contrasting in color with the background, and shall be in plain view of the public.

Exception: Personal motor vehicles of principal owner(s) and of certified operator(s) in charge of pest control activities of a licensee, as registered with the Department are exempt from the requirements of subsections 5E-14.103(1) and (2), F.A.C., when such vehicles are not actively, constantly and regularly used in the conduct of pest control for the licensee.

Rulemaking Authority 482.051(2) FS. Law Implemented 482.051(2), 482.161, 482.191 FS., Section 1, Chapter 92-203, Laws of Florida. History--New 1-1-77, Joint Administrative Procedures Committee Objection Withdrawn – See FAW Vol. 3, No. 30, July 29, 1977, Amended 6-27-79, Formerly 10D-55.103, 6-2-04.

5E-14.104 Prohibited Acts.

(1) In solicitation of pest control business, no licensee or its employees shall claim that inspections or treatment are required, authorized or endorsed by the Department.

(2) No reference shall be made in any manner suggesting approval, endorsement or recommendation by the Department.

(3) No licensee, certified operator or identification card holder shall advertise or hold himself out in any manner in connection with pest control as an entomologist, horticulturist, public health engineer, sanitarian, and the like, unless such persons qualified in such field by required professional and educational standards for the title used.

(4) No licensee or its employees shall represent to any property owner or occupant of any structure that any

specific pest is infesting said property, structure, or lawn or ornamental thereof, or that it requires a specific treatment for pest control when an infestation, or strongly supporting evidence of such infestation, does not exist. Exception: This prohibition shall not apply to bona fide preventive treatments which imply no infestation per se.

(5) Pesticides shall not be given or sold to the public except in unbroken, original and labelled containers in accordance with Section 487.031, F.S.

(6) No employee of a licensee shall perform pest control or “moonlight” pest control independently.

(7) Licensees shall not purchase a residential fumigant or perform fumigation using a residential fumigant unless the licensee and their fumigation employees have agreed to and are in compliance with the label requirements and Stewardship Policy requirements for the residential fumigant as defined in rule 5E-2.0312, F.A.C.

(8) A licensee’s fumigation employee shall not perform or assist in a fumigation unless the employee has completed all training required by the Stewardship Policy for the residential fumigant to be used in the fumigation, as set forth in rule chapters 5E-14 and 5E-2, F.A.C.

Rulemaking Authority 482.051, 570.07(23) FS. Law Implemented 482.021(13), (15), 482.051(1), 482.071, 482.091, 482.111, 482.152, 482.161, 482.191 FS. History—New 1-1-77, Amended 6-27-79, Formerly 10D-55.104, Amended 8-11-93, 5-7-17.

5E-14.105 Contractual Agreements in Public’s Interest – Control and Preventive Treatment for Wood-Destroying Organisms.

(1) Each licensee must enter into a written contract with the property owner or his authorized agent for each treatment for control or prevention of wood-destroying organisms. No such contract shall be entered into after six (6) months following the effective date of this rule without first obtaining specific written consent signed by the property owner or authorized agent using the Consumer Notice Form, FDACS-13692, Rev 07/21, which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-13400>, or at 3125 Conner Boulevard, Bldg. 8, Tallahassee, Florida 32399-1650.

(2) Such contract, except as provided in subsection (3) of this section, or an exact copy thereof must be given to the property owner or his authorized agent for acceptance or rejection before any portion of the work is done and before payment, in part or in full, is received by the licensee. The contract shall clearly set forth the following information:

(a) The complete name and address of the property owner or authorized agent and the complete address of the property to be treated.

(b) All buildings or structures on the property to be included for treatment.

(c) The complete name and business address of the licensee.

(d) The date upon which the written contract is entered into, the period of time covered by the contract, and renewal option, if any.

(e) The complete common name(s) of the wood-destroying organism(s) to be controlled or for which preventive treatment is intended under the contract. Any contract for the treatment or prevention of termites must clearly state on the first page if the contract covers subterranean termites, dry wood termites, or both. If Formosan termites (*Coptotermes formosansus*), or other invasive termite species, are to be excluded from coverage, the species must be named as excluded.

(f) If an existing infestation is known to be present at the time of treatment, the treatment is for control of existing infestation.

(g) Whether or not reinspections are to be made under the contract and, if so, approximate time intervals between reinspections, and fees other than renewal fees for same, if any.

(h) The conditions under which retreatments (for reinfestation) will be made; and conditions under which repairs will be made, if any.

(i) The total maximum price to be charged for treatment service, the exact annual renewal fees to be charged under the contract, if any; and the total maximum price to be charged for structural repairs, if any, shown separately.

(j) If the performance of the work is guaranteed by any type or form of bond, the obligations of the bond shall be set forth specifically: i.e., necessary retreatments, repairs, etc., in wording identical to that in the bond itself.

(k) The signature of the licensee or his authorized representative, and the signature of the property owner or

authorized agent.

(3) Contracts covering treatments for the prevention of subterranean termites for new construction:

(a) Shall clearly set forth that additional treatment(s) shall be performed to control an infestation should subterranean termite infestation occur to the structure treated during the warranty period. The warranty shall show either the date of initial or final treatment and shall be issued to the property owner or agent within 30 days of the date of initial or final treatment, whichever is specified on the contract, and shall be for a period no less than one year from date of treatment specified on the contract, and

(b) The property owner at the time of each renewal, if a previous renewal was purchased, shall have the option of extending the warranty annually after the first year for no less than 4 additional years. The contract shall conform with Section 482.227, F.S., and contain information required by paragraphs 5E-14.105(2)(a), (b), (c), (d), (e), (f), (g), (h), (i) and (j), F.A.C., and

(c) For treatment of multiple properties for a single owner, if individual contracts are not issued prior to treatment, a licensee shall either enter into a master agreement with the owner or authorized agent prior to treatment that provides for the fulfillment of the requirements of paragraphs (a) and (b), above, or issue an assignable contract on the property on completion of the treatment.

(d) This section applies only to treatment for the prevention of subterranean termites for new construction which does not physically attach to or adjoin existing structures.

(4) In contracts covering spot treatments for wood-destroying organism(s), the requirements of subsections 5E-14.105(1) and (2), F.A.C. shall apply. In addition to these, specific areas in, on or under the structure to be treated shall be listed in the written contract and a statement that a spot treatment only was performed shall be made on the treatment notice posted as required by Section 482.226(5), F.S.

(5) If no responsibility is to be assumed by the licensee for retreatment of the specific area(s) of a structure where spot treatment is to be made, the licensee shall furnish the property holder or his authorized agent with a signed statement to this effect, prior to treatment.

(6) When periodic reinspections are specified in wood-destroying organisms preventive or control contracts, the licensee shall furnish the property owner or his authorized agent, after each reinspection, a signed report of the condition of the property with respect to presence or absence of wood-destroying organisms covered by the contract and whether retreatment was made. A copy of the inspection report shall be retained by the licensee for a period of not less than three (3) years.

(7) A structure shall not be knowingly placed under a second contract for the same wood-destroying organism control or preventive treatment in disregard of the first contract, without first obtaining specific written consent signed by the property owner or authorized agent using the Consumer Consent Form, FDACS-13671, Rev. 09/16, which is hereby adopted and incorporated by reference and available online at <http://www.flrules.org/Gateway/reference.asp?No=Ref-07325>, and on the department's website under the header "Forms" at <https://www.FDACS.gov> or at 3125 Conner Boulevard, Suite N, Tallahassee, Florida 32399-1650.

(8) Each licensee shall comply with the terms of each pest control contract it issues. Within one year of the effective date of this rule, all contracts for wood destroying organism protection must comply with the following:

(a) A licensee must inspect for an infestation that is the subject of a re-treatment provision of a contract within thirty calendar days of written notification by the property owner or agent to which the contract applies, and must perform a re-treatment required under a contract within ninety days of discovery of an infestation subject to the re-treatment provision of a contract, unless;

1. Access to the property is prevented by the property owner, or
2. The treatment is waived or postponed in writing by the property owner or agent, or
3. The subject property is a commercial or multiunit structure, in which case, the treatment must be performed within 180 days, unless subparagraphs 1. or 2., above applies.

(b) In the event a contract expires before a re-treatment, subject to paragraph (8)(a), above, can be accomplished, the licensee shall make a written offer to perform the re-treatment in accordance with the terms of the contract within ninety days at no additional cost.

(c) A licensee may not use a limitation, exclusion, or condition clause of a contract to deny treatment of a termite

infestation or repair of termite damage to the holder of a contract, unless the termite infestation or damage was primarily caused by the subject of the limitation, exclusion, or condition clause in the contract, and, if the licensee was aware of the condition that is subject to a limitation, exclusion, or condition clause in the contract, the licensee provided written notice to the property owner or agent of that condition within sixty days of discovery and provided the property owner the opportunity to correct that condition. If the property owner did not correct the condition within sixty days of the written notice, then the licensee may use the limitation, exclusion, or condition clause in the contract to deny repair or re-treatment.

(9) A licensee acting as a primary contractor who may subcontract the performance of the work to another licensee shall notify the customer that the performance of the work may be assigned to another licensee other than the primary contractor. This written notification shall be part of the contract as a separate statement itself or attached to the contract as a separate document, and must be signed or initialed by the consumer.

Rulemaking Authority 482.051, 570.07(22), 570.07(23) FS. Law Implemented 482.051(3) FS. History—New 1-1-77, Joint Administrative Procedures Committee Objection Withdrawn – See FAW Vol. 3, No. 30, July 29, 1977, Amended 6-27-79, 10-25-90, Formerly 10D-55.105, Amended 8-11-93, 4-17-03, 6-1-06, 9-17-08, 11-26-08, 1-9-17, 8-8-21.

5E-14.106 Use of Pesticides – Labels, Limitations, Precautions.

(1) Only those pesticides having federal or state label registration clearance shall be used. It shall be unlawful to use any registered pesticide in a manner inconsistent with its label and labeling, except as provided by the United States Environmental Protection Agency, the United States Department of Agriculture, or the Department.

(2) Licensees and certified operators shall maintain at the licensed business locations specimen copies of current registered labels for all pesticides used in their pest control operations which labels shall be available for inspection upon request.

(3) All pesticide concentrates used in the field shall be kept under lock when in unattended service vehicles. They shall be kept in leakproof containers legibly tagged or labelled for identification and providing information required by EPA regulations or recommendations.

(4) Pesticides kept in containers other than application equipment shall be accurately identified by permanent, durable label or tag, showing the common or chemical name(s) of principal active ingredient(s) and providing information required by EPA regulations or recommendations.

(5) Spray tanks in which pesticides are mixed or from which pesticides are dispensed in pest control operations and to which water is added shall not be filled through direct fill-pipe or hose connections protruding into the spray tank. Fill-pipes or hoses must terminate at least two inches above spray tank intake fill opening or be equipped with an effective anti-siphoning device to prevent back siphonage into water supply.

(6) Pesticides used as the primary treatment for the prevention of subterranean termites for new construction shall be applied in the specific amounts, concentration, and treatment areas designated by the label.

(7) Each pesticide used for the primary preventive treatment of new construction for the prevention of subterranean termites, in its original formulation, shall be mixed at the treatment site immediately before application.

(8) For each pesticide used for preventive treatment for new construction, a copy of the label of the registered pesticide being used shall be carried in the vehicle from which the application is performed. The licensee shall maintain records for 3 years of each treatment for the prevention of subterranean termites for new construction indicating the date of treatment, address of property treated, total square footage of structure treated, pesticide used, percent concentration of mixture applied and total volume applied as well as maintaining records of all termiticides purchased, obtained, or available for its use; the total amount of the area treated; and the total number of sites treated using this and any other method of treatment for the prevention of subterranean termites.

(9) When a pesticide registered as a preventive treatment for new construction has been applied as the primary preventive treatment for a structure in accordance with subsection 5E-14.106(6), F.A.C., or will be applied before completion of construction, a secondary treatment using a second pesticide registered for preventive treatment for new construction may be applied in accordance with label directions.

Rulemaking Authority 482.051 FS. Law Implemented 482.051(1) FS., P. L. 92-516, Section 1, Chapter 92-203, Laws of Florida. 482.051(5) FS., Chapter 2006-289 (July 1, 2006), Laws of Florida. History—New 1-1-77, Amended 6-27-79, 6-22-83, 10-25-90,

Formerly 10D-55.106, Amended 7-5-95, 4-17-03, 6-30-05, 7-11-07.

5E-14.107 Sodium Fluoroacetate (Compound 1080) Rodenticide – Use Restrictions and Precautions.

Rulemaking Authority 482.051(1) FS. Law Implemented 482.051(1) FS. Section 1, Chapter 92-203, Laws of Florida. History–New 1-1-77, Formerly 10D-55.107, Repealed 6-27-79 (by 20.19 FS.).

5E-14.108 Fumigation Requirements – General Fumigation.

(1) Each general fumigation (subsection 5E-14.102(4), F.A.C.) shall be personally directed, supervised and performed by a certified fumigation operator or personally by a special fumigation identification card holder authorized by the Department and designated by and under the direction and supervision of the certified fumigation operator in charge (section 482.151, F.S.). Such certified fumigation operator or his designated special fumigation identification card holder shall be available and on call at all times during the fumigation period (subsection 5E-14.102(3), F.A.C.) of each general fumigation (subsection 5E-14.102(4), F.A.C.) job in progress.

(2) Whenever the presence of two (2) persons trained in the use of the fumigant is required by the fumigant label, at least one of these persons must be either a certified operator of fumigation or a designated special identification fumigation cardholder. The second person shall be a certified fumigation operator, a special identification cardholder, or an identification cardholder with a Fumigation Identification Card endorsement on the employee identification card, which may be obtained as provided in subsection 5E-14.1421(5), F.A.C. Two (2) trained persons shall be present at each fumigation site for the introduction of the fumigant, entry during fumigation, and from the start of aeration (first opening of the seal) until the active aeration period with all operable doors and windows open, if required by the fumigant label, is completed and the structure is secured for the remaining aeration period. The certified operator in charge of fumigation or his designated special identification cardholder shall be present at those times required by the fumigant label or by subsections 5E-14.108(1), 5E-14.111(4), 5E-14.112(1) and 5E-14.113(1), (2), F.A.C.

(3) It shall be the duty of the certified operator in charge of fumigation to carry out the following:

(a) Train and/or verify training to each special fumigation identification cardholder in proper fumigation procedures as required by regulations and fumigant label directions, and to know the location, purpose, use and maintenance of personal protective equipment and fumigant detection and safety devices and when and how to use this equipment.

(b) Train each identification cardholder, assigned to fumigation work, in basic fumigation procedures, SCBA (self contained breathing apparatus) use and the proper use of fumigant safety equipment and to report immediately to the certified operator in charge or his special fumigation identification cardholder any irregularities or emergencies.

(4) The department shall issue an immediate stop-use or stop-work order by utilizing the department's electronic fumigation notification website at <http://fumigation.freshfromflorida.com> or issuance of a Fumigation Stop-work or Use Order, (FDACS-13659, (Rev. 01/17), which is hereby adopted and incorporated by reference and available online at <http://www.flrules.org/Gateway/reference.asp?No=Ref-07902>, for fumigation performed in a manner that presents an immediate serious danger to the health, safety or welfare of the public. Fumigant use or work shall not be resumed until corrections are made, verified, and either the release section of the stop order is completed by department personnel or the stop order is removed from the electronic fumigation notification system at <http://fumigation.freshfromflorida.com>.

(5) Fumigators must have in their possession any keys or an access device necessary to gain the immediate access to a structure, including secondary locking devices, during the entire time that the structure is under fumigation (fumigant release, exposure period, aeration and until properly determined clear of all fumigant), unless a waiver is issued for specialized structures by the Department of Agriculture and Consumer Services.

(6) When crew members are present on the fumigation site, two properly functioning, positive pressure, self-contained breathing apparatus (SCBA) must be available at the fumigation site at all times when the structure is under fumigation (fumigant release, exposure period, aeration and at other times when state law or the fumigant label requires the use or presence of a SCBA). Two SCBA do not need to be present at the fumigation site for activities that do not involve worker exposure to fumigant concentrations above thresholds permitted by the fumigant label. Such activities could include, but would not be limited to, remote monitoring, using a Fumiscope, TIF leak detection, job

site cleanup, DACS inspections, and Quality Assurance Reviews.

(7) Each business licensee location performing fumigation must own at least two, label-approved, clearance devices so that at all times, a licensee has access to a properly functioning clearance device which must be calibrated in accordance with either the device manufacturer or the fumigant label directions, whichever is more restrictive.

(8) Licensees performing fumigations using a residential fumigant must ensure that all functioning and non-functioning fumigant clearance devices being used by the licensee are recorded within the department's electronic fumigation notification website at <http://fumigation.freshfromflorida.com>. Information recorded must include the name of the manufacture, serial number, last known date of calibration and operational status of each device. The department shall grant access to third parties for the purpose of verifying that the records maintained on the fumigation notification website are accurate. It is solely the licensee's obligation to ensure that all data submitted to the department is accurate.

(9) Licensees performing fumigations with a residential fumigant must agree to, in writing, and be in compliance with the Stewardship Policy requirements for the residential fumigant used, including having completed all training and quality assurance review(s) required under the relevant Stewardship Policy. New fumigation employees must receive Initial Stewardship Training on the residential fumigant(s) used by the licensee within 60 days of their first day of employment by the licensee, if the new fumigation employee did not receive that stewardship training earlier in the calendar year. Current employees of the licensee who transition to working as fumigation employees must receive Annual Stewardship Training on residential fumigant(s) used by the licensee within 60 days of receiving their new identification cards (e.g. as a certified operator for fumigation, a special identification cardholder, or an ID cardholder with a fumigation endorsement) if they did not receive that stewardship training earlier in the calendar year.

(10) A licensee subcontracting a residential fumigation job to another licensee shall inform the subcontracted licensee of the residential fumigant to be used based on the residential fumigant fact sheet provided to the customer. The subcontracted licensee shall use the residential fumigant as designated by the contracting licensee and must provide proof of stewardship training for the residential fumigant designated by the contracting licensee upon request.

Rulemaking Authority 482.051, 570.23(07) FS. Law Implemented 482.021(7), (25), 482.032, 482.051(1), 482.051(6), 482.061, 482.152, 482.163 FS. History—New 1-1-77, Amended 6-22-83, Formerly 10D-55.108, Amended 7-5-95, 6-12-02, 4-17-03, 5-7-17.

5E-14.109 Fumigation Requirements – Safety, Safety Equipment, Crews.

Rulemaking Authority 482.051 FS. Law Implemented 482.051(1), 482.152, 482.241 FS. Section 1, Chapter 92-203, Laws of Florida. History—New 1-1-77, Amended 6-27-79, 6-22-83, 1-20-87, Formerly 10D-55.109, Repealed 7-5-95.

5E-14.110 Fumigation Requirements – Notices.

(1) Each licensee, before performing general fumigation, shall notify the department at least twenty-four (24) hours in advance of the fumigation period. Notification shall be made utilizing the department's electronic fumigation notification website <http://fumigation.freshfromflorida.com> or by submitting by facsimile, a completed Notification of Fumigation, FDACS-13667, Rev. 07/21, which is hereby adopted and incorporated by reference and available online at <http://www.flrules.org/Gateway/reference.asp?No=Ref-13396>, to the facsimile number located on the form. The notice shall accurately state the following:

- (a) Company name and business location address.
- (b) Accepted common or trade name and active ingredients of fumigant to be used.
- (c) Name of certified operator in charge or the designated certified operator(s) or special fumigation identification card holder(s) for the fumigation, together with her or his day and night telephone numbers.
- (d) Location (address), county, type of structure (single family, multi-family, commercial, vault or other), structure use (residence, school, church, warehouse, store/shopping, vehicle, vault, or other) and number of structures to be fumigated.
- (e) Date of fumigation.
- (f) Target pest.
- (g) Contractor's name (if subcontracted).

(h) Approximate duration of fumigation.

(i) Reason for less than 24 hour notification.

(2) Any change(s) in information required in notices by this regulation shall be reported via the electronic submission website or in writing via facsimile in advance of the fumigation period.

(3) Exceptions: Notification of less than 24 hours is allowed only for verifiable situations affecting the health, safety, and welfare of the public and severe weather conditions. Notification shall be made immediately before the fumigation period by advance electronic submission via <http://fumigation.freshfromflorida.com>, or electronic mail to biirfumigation@FDACS.gov, or facsimile to (850)617-7968.

(4) A licensee that performs chamber or vault fumigations on the premises of the licensee's licensed business location shall notify the department annually in writing. This notice may be submitted using the electronic notification system at <http://fumigation.freshfromflorida.com>. Information required in the written notification shall include the type (or description) of chamber being used on the property (such as shipping containers, trucks, PODS, tarpaulin areas, etc.), and the days of the week and hours during which these fumigations may be performed during the year of notification. The licensee shall provide the department at least 24 hours notice of any changes in the days of the week and hours during which fumigations may be performed.

Rulemaking Authority 482.051, 570.07(23) FS. Law Implemented 482.051(4) FS. History—New 1-1-77, Amended 6-27-79, 6-22-83, 10-25-90, Formerly 10D-55.110, Amended 7-5-95, 9-17-08, 9-6-10, 5-7-17, 8-8-21.

5E-14.111 Fumigation Requirements – Application; Restrictions and Precautions.

(1) For purposes of fumigation “structure” shall mean: any building including its foundation, walls and roof but excluding any surfacing portions such as driveways or walkways that merely lie on the land and provide no means for a fumigant to pass outside of the fumigation seal.

(2) Neither the structure nor enclosed space to be fumigated nor any part or parts thereof shall be occupied by persons during the fumigation period. In addition, structures or enclosed spaces which are physically connected with the structure to be fumigated shall not be occupied by persons during the fumigation period. (See subsections 5E-14.111(3) and (4), F.A.C.)

(3) In the event one or more units in a multi-unit structure (see subsection 5E-14.102(9), F.A.C.) are to be fumigated, the entire multi-unit structure must be vacated before fumigation and individually tested for clearance in accordance with label instructions following fumigation. If these requirements cannot be met, the fumigation shall not be performed.

(4) It shall be the duty of the certified operator in charge or his designated special fumigation identification card holder to be present and personally make a careful examination of all parts of the structure to be fumigated, such as locked rooms, compartments, closets, enclosed spaces and any connected structures, to verify that no persons have remained therein.

(5) Fumigation of structures shall be performed in strict accordance with the registered label and labeling directions and precautions for the intended use and type of structure, provided there is sufficient distance along the entire length of the passageway between the structure(s) to be fumigated and all adjacent occupied structure(s) to allow visible inspection, with or without egress, for connected structures as defined in subsection 5E-14.102(17), F.A.C., and inspection for and sealing of exterior openings, such as vents, windows, etc., that require sealing for adequate fumigant confinement. If these requirements cannot be met, the fumigation shall not be performed unless the adjacent structure(s) is vacated.

(6) When fumigating structures with methyl bromide, sulfuryl fluoride or any other relatively odorless gas, technical chloropicrin shall be used separately as a warning agent immediately before release of the relatively odorless gas at the rate of not less than one fluid ounce per 15,000 cubic feet of space to be fumigated or as otherwise directed by fumigant label.

Exceptions: This section shall not apply to the fumigation of common carriers (trucks, box cars, refrigerator cars), the fumigation of tobacco warehouses and factories, the fumigation in tanks, vaults or chambers, or the fumigation of commodities in industrial areas when it has been determined by prior inspection by the certified operator in charge that no danger to human life or health exists unless required by the fumigant label.

(7) The structure or enclosed space must be made as gas-tight as is practicable. Structures or enclosed spaces which cannot be made reasonably gas-tight by sealing or tenting shall not be fumigated.

Rulemaking Authority 482.051 FS. Law Implemented 482.051(1), 482.152, 482.241 FS. History—New 1-1-77, Amended 6-27-79, 6-22-83, Formerly 10D-55.111, Amended 8-11-93, 9-17-08, 9-6-10.

5E-14.112 Fumigation Requirements – Prefumigation Inspections, Evacuation, Warning Notices (Signs), Special Safety Precautions and Responsibilities.

(1) Final pre-application of fumigant and evacuation inspection: Before the fumigant(s) is to be applied, the certified operator in charge or his designated special fumigation identification card holder must make a final, personal inspection of the structure and shall ensure that:

(a) All preparations for fumigation as directed by the label have been completed.

(b) No unauthorized person is present within the structure or enclosed space to be fumigated or in any adjacent structures or spaces that are required by these regulations to be vacated because of danger from the fumigation operation.

(c) No open fires, flames, pilot lights or oil lamps are burning.

(d) The final inspection must be conducted immediately before the fumigant is to be applied, unless the structure is a multi-unit dwelling, in which case, the following special provision shall apply:

On multi-unit dwellings, the certified fumigation operator in charge and/or his designated special fumigation identification cardholder shall conduct a thorough, systematic inspection of each room in every unit to ensure that all provisions specified above have been completed. Then, exterior doors and/or entrances of each inspected unit shall be secured against unauthorized re-entry while preparations and inspection of other units or areas of the structure are completed. This may require the temporary use of secondary locks on entrances that are to be left unattended between the time of inspection and the introduction of the fumigant. If an individual unit or units cannot be safely secured while preparations of other areas are taking place, then those units must be re-inspected immediately before the fumigant is to be applied.

(2) Before the application of fumigant(s), suitable warning signs of stiff, weather-proof material must be securely affixed and conspicuously posted as follows:

(a) In tape-and-seal fumigation operations: at or on all doors and entrances to the structure or enclosed space, and at least one (1) warning sign on all sides of the structure or enclosed space not having a door or entrance;

(b) In tent fumigation operations and also including commodity fumigations: at least one (1) warning sign posted at or on all doors and entrances to the structure or enclosed space and at least one (1) warning sign on all sides of the outside of the tents or sealing covers of the structure, enclosed space or commodities being fumigated;

(c) At all doors and entrances to common carriers or enclosed space fumigated;

(d) Upon all gangplanks, ladders, etc. from the dock, pier or land to vessel.

(e) On multi-unit dwellings, warning signs must be posted at or on all exterior doors or entrance(s) of the structure which, depending on construction, might require sign(s) on all exterior doors or entrances of each individual unit or apartment.

(3) Warning signs shall conform in design and information set forth as follows:

(Skull and Crossbones Symbol)	Danger	(Skull and Crossbones Symbol)
	Fumigating with	
	(Accepted common name of Fumigant)	
	Deadly Poison	
	All Persons are Warned to Keep Away	

Date and time fumigant was introduced ____

Company Name ____

Company Business Address ____

Certified Operator in Charge ____

Fumigant Introduced by ____

Day Telephone _____

Night Telephone _____

(4) Signs required must be printed, painted or made in indelible red ink or paint insoluble in water, on white background. The words "Danger" and "Deadly Poison" shall be in block lettering at least two (2") inches high. The name of the fumigant shall be at least five-eighths (5/8") inch high. The skull and crossbones symbol shall be at least one (1") inch high. All other lettering on the sign must be not less than one-half (1/2") inch high.

(5) All information displayed on warning signs must be accurate and legible. The name and day and night telephone number of the certified operator in charge of fumigation, or a certified fumigation operator, or a special fumigation identification cardholder who introduced the fumigant at the fumigation site must be displayed on the warning sign. Additional numbers and other contact information may be placed on the sign. All emergency phone numbers must be a phone number, mobile/cell phone number or beeper number in the possession of a person familiar with the job and trained to respond to fumigation emergencies and equipped with label required respiratory protection and gas detection equipment. Answering machines, beepers or voice mail systems that do not provide a mechanism for immediate notification to an individual as described above are prohibited. A 24 hour manned answering service that can immediately contact a certified fumigation operator or a special fumigation identification cardholder of the company who can respond to the emergency is acceptable.

(6) Such warning signs posted on the outside of tents or sealing covers shall not be removed before commencement of ventilation: and such warning signs posted on or at entrances to the structure (itself), enclosed space or commodities being fumigated shall not be removed until the end of the fumigation period, when ventilation has been completed and the premises declared safe for reoccupancy as required by subsections 5E-14.113(1) and (2), F.A.C. Ventilation shall be conducted with due regard for the public safety.

(7) Special safety precautions, responsibilities.

(a) When conditions involving abnormal hazards exist, it shall be the responsibility of the person exercising direct and personal supervision of the fumigation operation to take such safety precautions additional to those prescribed by this chapter as are reasonably necessary to protect the public health and safety.

(b) All exterior doors and entrances to the fumigated structure(s) shall be posted with a warning sign on or at each door or entrance before the release of the fumigant, locked, and secured with a secondary locking device(s) or barred or otherwise secured against entry until the end of the exposure period, then opened for ventilation and relocked, barred or otherwise secured against reentry, including the reinstallation of the secondary locking device(s), until declared to be safe for reoccupancy by the person exercising direct and personal supervision of the fumigation operation as required by subsections 5E-14.113(1) and (2), F.A.C. A door or entrance, that, once locked from the interior with a lock that is not accessible from the exterior, does not require a secondary locking device or barricade.

(c) Entrances which do not have existing locking mechanisms or are inoperable must still be secured with a secondary locking device.

(d) If multi-unit dwellings with internal stairwells accessing each floor can be secondarily locked or secured, barred or barricaded at all ground level entrances, then no other secondary locking devices are necessary, provided that the requirements of subsection 5E-14.112(1), F.A.C., are met. Multi-unit dwellings with exterior stairwells or fire escapes must be secured or otherwise barricaded or barred to prevent entry from both ground and first floor levels and from any entrance to the structure accessed from the stairwell or fire escape. If neither of these conditions can be met, then all entrances to individual units and all exterior entrances must be locked or secured, barricaded or barred with secondary locking devices.

Rulemaking Authority 482.051 FS. Law Implemented 482.051(1), 482.152 FS. History—New 1-1-77, Amended 6-27-79, Formerly 10D-55.112, Amended 4-17-03, 9-17-08.

5E-14.113 Fumigation Requirements – Final Post-fumigation Clearance Inspection.

(1) The certified operator in charge or his designated special fumigation identification card holder shall personally determine by using label-approved gas-detecting devices, verified and/or calibrated as required by either the device manufacturer or the fumigant label directions, whichever is more restrictive, that the entire structure or enclosed space fumigated, and also including beds and bedding therein, has been safely ventilated as required by fumigant label directions, to permit safe human entry and occupancy or reoccupancy. No person, other than the certified fumigation

operator in charge, his designated special fumigation identification cardholder, or trained identification cardholder, utilizing the label-approved respiratory protective equipment or gas detecting device, may enter, occupy or reoccupy the fumigated structure for any reason before completion of the aeration procedure(s) and declaration of clearance. All warning agent containers shall be removed from the structure. In no instance shall ventilation or aeration time be less than that recommended by manufacturer of fumigant on the registered label.

(2) Declaring structure or enclosed space fumigated safe for entry and occupancy or reoccupancy: The certified operator in charge or his designated special fumigation identification card holder shall not permit or allow any unauthorized person to enter or occupy or reoccupy the structure or enclosed space fumigated until the aeration procedures as required by the fumigant product label are completed, and he has personally checked the breathing zone of each room within the fumigated structure for fumigant levels with suitable gas-detecting equipment or device required by the fumigant label and found the structure to be safe for human entry and occupancy, and he shall personally certify by his own signature as a result of his final personal inspection and monitoring examination of the entire structure or space fumigated that the same and adjacent vacated structures are safe for human entry, occupancy or reoccupancy. Such notice of clearance shall be in writing and shall be conspicuously posted by the certified fumigation operator in charge or his designated special fumigation identification cardholder on all entrances of the fumigated structure or enclosed space. Clearance notices may not be posted before performing the clearance inspection with the label required gas-detection equipment. The signature of the certified operator in charge or his designated special fumigation identification card holder and the exact date and hour of release for reentry and reoccupancy shall be set forth in all notices. In no case shall the notice of clearance be post-dated.

Rulemaking Authority 482.051 FS. Law Implemented 482.051(1), 482.152 FS. History—New 1-1-77, Formerly 10D-55.113, Amended 4-29-02, 4-17-03.

5E-14.110 Fumigation Requirements, Fumigation Vaults, Chambers.

Rulemaking Authority 482.051 FS. Law Implemented 482.021(6), 482.151(1), 482.152 FS. Section 1, Chapter 92-203, Laws of Florida. History—New 1-1-77, Formerly 10D-55.114, Repealed 7-5-95.

5E-14.115 Fumigation Requirements – Spot Fumigation, Sub-slab Fumigation, Soil Fumigation.

Rulemaking Authority 482.051(1) FS. Law Implemented 482.051(1), 482.151(1), 482.152 FS. Section 1, Chapter 92-203, Laws of Florida. History—New 1-1-77, Amended 6-27-79, 6-22-83, Formerly 10D-55.115, Repealed 7-5-95.

5E-14.116 Fumigation Restrictions and Exemptions.

Rulemaking Authority 482.051 FS. Law Implemented 482.051(1) FS. Section 1, Chapter 92-203, Laws of Florida. History—New 1-1-77, Formerly 10D-55.116, Repealed 8-11-93.

PART II APPLICATION FOR EXAMINATION

5E-14.117 Application for Department Credentials.

(1) An applicant for examination or reexamination for a pest control operator's certificate and special identification card shall complete the application process online at <https://www.FDACS.gov>, or submit the following forms to 3125 Conner Boulevard, L8, Tallahassee, Florida 32399-1650. Applications for examination must be made within one year after the applicant's employee identification card expiration date.

(a) Pest Control Examination Application, FDACS-13607, Rev. 07/21, which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-13393>.

(b) Employment Service, FDACS-13627, Rev. 10/15, which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07306>.

(c) Documented Pesticide Application for Certification Exam Qualification, FDACS-13653, Rev. 10/15, which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07307>.

(2) An applicant having three years documented service employment with a licensee who performs pest control in all categories, as defined in Section 482.021(3), F.S, is qualified for examination in all categories, provided the applicant has a minimum of nine (9) months service employment in each category for which he makes application for examination.

(3) An applicant having three years service employment with a licensee who performs pest control in less than all categories is qualified for the examination in those categories only, unless an applicant, already certified, qualifies for examination in an additional category after having nine (9) months service employment with a licensee who performs pest control in such additional category.

(4) A department identification card held for three years as a service employee will constitute proof of experience with respect to the time requirement in subsection (2) or (3). A maximum of two (2) years of documented out-of-state experience will be credited on an equivalent basis. The department will accept the following documents as proof of out-of-state experience: payroll records; notarized letters of experience; and certifications regulating pest control issued by an out-of-state agency. Agricultural pesticide applicator licenses/licensing do not apply toward the credit or equivalent basis.

(5) Any applicant for examination whose license, identification card, pest control operator's certificate or special identification card has been denied (issuance stopped), suspended, revoked or is on probation by the department, shall not be permitted to take any examination while under such denial, suspension, revocation or probation.

(6) Applicants may be examined for certification in one or more of the following categories of pest control:

(a) Fumigation;

(b) General household pest control, which includes rodent control;

(c) Termite or other wood-infesting organism control;

(d) Lawn and ornamental pest control.

(7) Prior to application for examination:

(a) An applicant for examination for Termite/Wood Destroying Organism Pest Control, Lawn and Ornamental Pest Control, or General Household Pest Control certification must:

1. Participate in a minimum of 45 jobs in Florida under the supervision of a certified operator in each category that the applicant seeks certification.

2. Document all 45 jobs on the Documented Pesticide Application for Certification Exam Qualification, (FDACS-13653, Rev. 10/15), and the supervising certified operator shall certify the documented jobs were participated in by the applicant under their supervision and that the applicant has demonstrated the requisite knowledge to perform and supervise such work.

(b) An applicant for the Fumigation certification and a Special Identification Card must:

1. Participate in a minimum of 15 jobs in Florida under the supervision of a certified operator prior to application for examination.

2. Document their participation in 15 general fumigations (as defined by subsection 5E-14.102(4), F.A.C.), on the Documented Pesticide Application for Certification Exam Qualification, (FDACS-13653, Rev.10/15), as adopted in paragraph 5E-14.117(1)(c), F.A.C., and the supervising certified operator shall certify that the documented jobs were participated in by the applicant under their supervision and that the applicant has demonstrated the requisite knowledge to perform and/or supervise such work.

3. Applicants for special identification card examination are not required to be high school graduates.

(c) For purposes of this section, a "job" shall mean the active participation in all aspects of a complete individual pesticide application or inspection, specific to a target pest at a designated location and address, in the pest control category for which the applicant has applied for examination. If seeking to be examined in the Termite and Other Wood Destroying Organism Pest Control Category, an applicant shall not submit more than 15 wood-destroying organism inspections as described in paragraph 5E-14.142(5)(c), F.A.C., as part of the 45 job requirement.

(8) An applicant for limited certification in Commercial Landscape Maintenance shall complete the initial exam application or renewal process online at <https://www.FDACS.gov> or submit the following by mail to the address as instructed on the form:

(a) For initial applicants:

1. The initial examination fee of \$150.
 2. Limited Certification for Commercial Landscape Maintenance Personnel, FDACS-13604, Rev. 07/21, which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-13392>.
 3. Documentation of obtaining six (6) hours of plant bed and ornamental training approved by the department using the Record of Attendance for Continuing Education Units (CEUs), FDACS-13325, Rev. 05/04, as adopted in Rule 5E-9.029, F.A.C.; and,
 4. Proof of insurance using the Certificate of Insurance, FDACS-13688, Rev. 09/16, which is hereby adopted and incorporated by reference and available online at <http://www.flrules.org/Gateway/reference.asp?No=Ref-07309>.
- (b) For renewal applicants:
1. The annual recertification fee of \$75.
 2. Renewal Notice Limited Commercial Landscape Maintenance, FDACS-13680, Rev. 10/15, which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07310>.
 3. Documentation of obtaining four (4) hours of acceptable continuing education training submitted on the Record of Attendance for Continuing Education Units (CEUs), FDACS-13325, Rev. 05/04, as adopted in Rule 5E-9.029, F.A.C.; and,
 4. Proof of insurance using form, Certificate of Insurance, FDACS-13688, Rev. 09/16, as referenced in subparagraph 5E-14.117(8)(a)4., F.A.C.
- (9) An applicant who fails to pass one or more category or special identification card examinations may reapply for examination upon filing the prescribed application accompanied by a fee of \$300 for each category examination or \$200 for each special identification card examination.
- (10) An applicant for limited certification for governmental pesticide applicators or private applicators shall complete the initial application for examination on line at <https://www.FDACS.gov> or submit the following by mail to the address as instructed on the form.
- (a) For initial applicants:
1. The examination fee is \$150.
 2. Limited Certification for Government Pesticide Applicators or Private Applicators, FDACS-13610, Rev. 07/21, which is hereby incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-13394>; and,
- (b) For renewal applicants:
1. The renewal fee for the limited government/private certificate of \$25.00.
 2. Applicants can renew on line at <https://www.FDACS.gov>, or submit either a Renewal Notice Limited Government/Private Certificate Lawn and Ornamental Category, (FDACS 13682, Rev. 09/16), which is hereby adopted and incorporated by reference and available online at <http://www.flrules.org/Gateway/reference.asp?No=Ref-07312>, or a Renewal Notice Limited Government/Private Certificate Structural Category, FDACS 13683, Rev. 09/16, which is hereby adopted and incorporated by reference and available online at <http://www.flrules.org/Gateway/reference.asp?No=Ref-07313>; and,
 3. Proof of having obtained four (4) classroom hours of acceptable continuing education training, that is documented and submitted on the Record of Attendance for Continuing Education Units (CEUs) DACS 13325, Rev. 05/04, as adopted in Rule 5E-9.029, F.A.C.
- (11) Any person applying commercial fertilizer to an urban landscape must have a limited certification for urban landscape commercial fertilizer as provided herein. Applicants shall complete the initial application or renewal process online at <https://www.FDACS.gov> or submit the following by mail to the address as instructed on the form:
- (a) For initial applicants:
1. The application fee of \$25.00,
 2. A copy of the training certificate issued pursuant to Section 403.9338 F.S.,
 3. Application for Limited Certification for Urban Landscape Commercial Fertilizer, FDACS-13677, Rev. 07/21, which is hereby adopted and incorporated by reference and available online at

<https://www.flrules.org/Gateway/reference.asp?No=Ref-13397>; and,

(b) For renewal applicants:

1. The renewal fee of \$25.00,
2. Renewal Notice Limited Commercial Urban Fertilizer Applicator Certificate, FDACS 13681, Rev. 07/21, which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-13398>; and,
3. Proof of having obtained four (4) classroom hours of acceptable continuing education training documented on the Record of Attendance for Continuing Education Units (CEUs), FDACS 13325, Rev. 05/04, as adopted in Rule 5E-9.029, F.A.C. At least two (2) hours of this training must address fertilizer best-management practices.

(12) An applicant for limited certification for commercial wildlife management shall complete the initial application for examination or renewal process online at <https://www.FDACS.gov> or submit the following by mail to the address as instructed on the form:

(a) For Initial applicants:

1. The initial examination fee of \$150,
2. Limited Certification for Commercial Wildlife Management, FDACS-13685, Rev 07/21, which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-13399>; and,
3. Proof of insurance using the Certificate of Insurance, FDACS-13688, Rev. 09/16, as referenced in subparagraph 5E-14.117(8)(a)4., F.A.C.

(b) For renewal applicants:

1. The annual recertification fee of \$75.00,
2. Recertification Notice Limited Commercial Wildlife Management, (FDACS-13684, Rev 10/15), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07317>,
3. Proof of having obtained four (4) classroom hours of acceptable continuing education training documented on the form entitled, Record of Attendance for Continuing Education Units (CEUs), (FDACS-13325, Rev. 05/04), as adopted in Rule 5E-9.029, F.A.C.; and,
4. Proof of insurance, using the Certificate of Insurance, (FDACS-13688, Rev. 10/15), as referenced in subparagraph 5E-14.117(8)(a)4., F.A.C.

(13) All applicants for all certifications must be 18 years of age or older.

Rulemaking Authority 482.051, 482.151, 482.1562, 570.07(23) FS. Law Implemented 112.011(1), 482.111, 482.132, 482.141, 482.151, 482.152, 482.155, 482.156, 482.1562, 482.157 FS. History—New 1-1-77, Amended 6-27-79, 6-22-83, 10-25-90, Formerly 10D-55.117, Amended 8-11-93, 7-5-95, 5-28-98, 4-29-02, 7-11-07, 2-24-09, 5-12-10, 5-20-12, 1-9-17, 8-8-21.

PART III EXAMINATIONS

5E-14.123 Examinations.

(1) Regular written examinations will commence on the second Monday in March, June, September and December annually.

(2) The official application for admission to the examination shall be completed and submitted to the Department, by mail, postmarked not later than the second Monday in April for admission to the June examination, and not later than the second Monday in October for admission to the December examination; not later than the second Monday in July for the September examination and not later than the second Monday in January for the March examination.

(3) Applications and fees received by the Department postmarked after the deadline date will not be accepted and will be returned to the applicant.

(4) An examination fee of \$300 for each category of pest control in which the applicant desires to be examined must be paid by each applicant at the time he submits his application. Checks or money orders shall be made payable to the Department. Applications received without the required fees will be considered incomplete and will not be processed. Checks returned by the bank will invalidate the application for non-payment of fees.

(5) The fee for special identification card examination shall be \$200 for each category in which the applicant desires to be examined.

(6) Four (4) hours will be allotted for completing examinations in each category.

(7) Three (3) hours will be allotted for completing special identification card examinations.

(8) All examinations shall consist of theoretical questions, and practical questions. All applicants for examination for certification or special identification card will be examined on or required to demonstrate satisfactory knowledge of the following:

(a) Pest Control Act, chapter 482, F.S.

(b) Rules of the Department, chapter 5E-14, F.A.C., Pest Control Regulations, Parts No. 1 through 6.

(c) Precautions necessary and required by law, rules and good industry practice for the safeguard of life, health and property in the conduct of pest control.

(d) Pests, their habits, recognition of damage caused, and identification by accepted common names.

(e) Building construction terminology.

(f) Accepted good industry methods and practices founded upon recognized publications of the industry.

(9) In order to receive a passing grade on any examination, the following must be attained:

A total point score, equal to or exceeding seventy-five (75) percent of the total number of examination questions.

(10) Examinations shall be hand or machine scored and graded by or under the direction of the Department, and examinees notified by mail that they either passed or failed.

(11) Any applicant who fails to pass one or more particular examination(s) shall be permitted to review such examination(s) upon making written application to the Department within fifteen (15) days from date of written notice of examination results.

(12) Only those persons who failed to pass such examination(s) shall be admitted to the review and only in the categories failed.

Rulemaking Authority 482.051 FS. Law Implemented 482.141(2), 482.151(4) FS. History—New 1-1-77, Formerly 10D-55.123, Amended 8-11-93, 7-5-95, 5-28-98, 4-29-02, 4-17-03, 8-4-08.

PART IV CERTIFIED OPERATOR

5E-14.132 Certificate Issuance and Renewal Fees.

(1) The fee for issuance of each original certificate, and the fee for renewal thereof, shall be \$150.

(2) Each certified pest control operator shall be certified as provided by this rule. An applicant shall complete the application process online at <https://www.FDACS.gov> or submit the issuance fee as defined in subsection (1) above, with the Application for Pest Control Operator's Certificate, FDACS-13608, Rev. 10/16, which is hereby adopted and incorporated by reference and available online at <http://www.flrules.org/Gateway/reference.asp?No=Ref-07318>, to the address as instructed on the form.

(3) Annually, the department shall mail the Renewal Notice Certified Pest Control Operator, FDACS-13638, Rev. 07/21, which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-13395>, to the pest control operator's last known address filed with the department by the operator. Not less than 60 days prior to the expiration of a certificate, a final renewal notice shall be mailed to each certified operator who has not renewed their certificate. These notifications shall be the only notice of renewal issued by the department.

(a) Upon receipt of the renewal form referenced above in subsection (3), an operator may renew his or her certificate annually by completing the renewal application process online at: <https://www.FDACS.gov> or submitting the renewal fee as referenced above in subsection (1), with the Renewal Notice Certified Pest Control Operator, FDACS-13638, Rev. 10/15, as referenced and adopted in subsection (3) above, to address as instructed on the form.

(b) After a grace period of 30 calendar days following the anniversary date of each year, there shall be a late renewal charge of \$50, which shall be assessed and paid in addition to the renewal fee. Unless renewed as provided by this section, each certificate shall automatically expire 180 calendar days after the renewal date. Subsequent to such expiration, a certificate may be issued only upon successful reexamination and upon payment of examination and issuance fees due as provided by this rule.

(4) Standards for approval of continuing education providers:

(a) Providers seeking approval shall apply to the department online at <https://ceu.FreshFromFlorida.com> or submit the Request For Granting Continuing Education Units (CEUs) For Renewal of Pesticide Applicator Licenses and Certificates, (FDACS-13326, Rev. 05/04), as adopted in Rule 5E-9.029, F.A.C., as instructed on the form.

(b) All education offerings conducted by the provider shall contain one or more of the topics set forth in Section 482.111(10), F.S.

(c) All offerings shall be at least 50 minutes in length or one contact hour. Partial contact hours will not be accepted.

(d) Providers shall adhere to the numbering system and guidelines established by the department to include verification of attendance.

(e) There shall be a tangible plan for ongoing evaluation of program content, teaching staff, learning process and evaluation tools.

(f) Records of individual offerings shall be maintained by the department for one year after the next certificate renewal date.

(g) Providers shall furnish each participant with an authenticated individual certificate of attendance. It shall be the participants responsibility to store his individual attendance record for each offering until his or her renewal time. The attendance records will then be submitted with the renewal and fee.

(h) Providers shall designate a person to be responsible for the continuing education program.

(i) Provider approval shall be subject to periodic review and shall be withdrawn if adherence to standards and guidelines is not maintained or if information submitted by the provider is found to be a material misrepresentation of fact.

(j) Contact hours for continuing education offerings outside of Florida may be awarded following verification of:

1. Attendance on the Request For Granting Continuing Education Units (CEUs) For Renewal of Pesticide Applicator Licenses and Certificates, (FDACS-13326, Rev. 05/04), as adopted in Rule 5E-9.029, F.A.C.; and,

2. An agenda outlining the program's core content defining one or more of the topics set forth in Section 482.111(10), F.S., and hours credited.

Rulemaking Authority 482.051, 570.07(23) FS. Law Implemented 482.111, 482.132(1) FS. History—New 1-1-77, Amended 6-27-79, 6-22-83, 1-20-87, Formerly 10D-55.132, Amended 8-11-93, 7-5-95, 5-28-98, 4-29-02, 1-9-17, 8-8-21.

PART V SPECIAL IDENTIFICATION CARD

5E-14.136 Fumigation Special Identification Card Examination, Renewal Fees, Forms, and Duties.

(1) The examination fee for each fumigation special identification card and for each renewal thereof shall be \$100.

(2) An applicant shall apply for examination by completing the application process online at <https://www.FDACS.gov> or submit the examination fee with the Pest Control Examination Application FDACS-13607, Rev. 07/21, as referenced in paragraph 5E-14.117(1)(a), F.A.C., as instructed on the form.

(3) Annually, the department shall mail the Renewal Notice Special Fumigation Identification Card, FDACS-13641, Rev. 10/15, which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07327>, to the pest control operator's last known address filed with the department by the Special Fumigation Identification Card holder. Not less than 60 days prior to the expiration of a certificate, a final renewal notice shall be mailed to each Special Identification Card holder who has not renewed his special identification card. These notifications shall be the only notice of renewal issued by the department.

(a) Upon receipt of the renewal form referenced above in subsection (3), a cardholder may renew his or her certificate annually by completing the renewal application process online at: <https://www.FDACS.gov> or submitting the renewal fee as referenced above in subsection (1), with the Renewal Notice Special Fumigation Identification Card, FDACS-13641, Rev. 10/15, to address as instructed on the form.

(b) After a grace period of 30 calendar days following the anniversary date of each year, there shall be a late renewal charge of \$25, which shall be assessed and paid in addition to the renewal fee.

(c) Unless timely renewed, each special identification card shall automatically expire 180 calendar days after the

renewal date. Subsequent to such expiration, a special identification card may be issued only upon successful reexamination and upon payment of examination and issuance fees due, as provided by this rule.

(4) Each special identification cardholder shall notify the department in writing within ten (10) days of any change of his employment status or mailing address.

(5) No person shall use a special identification card in any category for which the certified operator in the charge of the pest control activities of the licensee is not properly certified.

(6) While performing pest control duties a special identification cardholder shall carry on his person a special identification card issued by the department.

(7) A special identification cardholder shall always perform his functions under the direction and supervision of his certified operator. No special identification cardholder shall perform any pest control work independently of or without the knowledge and direction of his certified operator.

Rulemaking Authority 482.051, 482.151, 570.07(23) FS. Law Implemented 482.151 FS. History—New 1-1-77, Formerly 10D-55.136, Amended 7-5-95, 5-28-98, 4-29-02, 1-9-17, 8-8-21.

PART VI LICENSEES

5E-14.140 Emergency Pest Control Certificate – Qualifications, Applications, Restrictions.

(1) An emergency pest control certificate, if issued, shall take effect on the exact date the loss or other emergency occurred.

(2) An initial 30 day emergency certificate shall be issued by the department upon verbal or written request of a licensee or his duly authorized agent. Requests for issuance of additional emergency certificates for periods not to exceed 30 days must be made in writing.

(3) For the purpose of this chapter “loss of a certified operator in charge or other emergency” means the unforeseen and unplanned parting or separation of his services from the licensee. The intentional or forced transfer or shifting of a certified operator in charge from one licensed business location to another owned by the same licensee shall not constitute a “loss of a certified operator in charge or other emergency.”

(4) No emergency certification referred to in this chapter shall carry with it authorization for use of restricted-use pesticides. Restricted-use pesticides may only be used under emergency certification where one or more individuals have taken and passed the examination for certification of applicators to apply restricted-use pesticides, as may be given by the Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, or an equivalent examination given by the Department.

(5) An emergency certificate shall not be issued in the category of fumigation.

(6) In issuing an emergency certificate or renewal thereof, the Department may require interim reports from the licensee at reasonable intervals and also including but not limited to what specific action is being taken to fill the vacancy.

Rulemaking Authority 482.051 FS. Law Implemented 482.051(1), 482.111(9) FS., Section 1, Chapter 92-203, Laws of Florida. History—New 1-1-77, Amended 6-27-79, 6-22-83, 10-25-90, Formerly 10D-55.140.

5E-14.142 Responsibilities and Duties – Records, Reports, Advertising, Applications.

(1) Records: Pest control records of the licensee pertaining to pest control activities and including contracts shall be kept at the licensed business location or at the exact Florida address specified in the application for business license for inspection by department inspectors for a minimum of two years. Additionally, routine operational records containing information on product brands (names), amounts, uses, dates, and places of application of restricted-use pesticides shall be kept at the licensed business location for a minimum of two years. Records kept electronically must be provided to the department upon request. Licensees operating in the category of fumigation shall record this information above along with the individual fumigant cylinder identification number utilized to fumigate a structure. Records for preventive treatment of subterranean termites in new construction shall be maintained for a minimum of three years pursuant to section 482.051(5), Florida Statutes.

(2) Pest control business licensees, certified operators, or employees of the licensee must supply any information

that supports application(s) or form(s) filed with the department and shall permit authorized department representatives to view any such records upon written request.

(3) Licensees performing fumigation with a residential fumigant, their employees, certified operators, and special identification cardholders shall comply with the label requirements and Stewardship Policy requirements of the residential fumigant being used.

(a) In addition, the following safety procedures shall be followed to enhance safety in the clearance of structures fumigated with a residential fumigant. The certified operator for the contracted licensee shall maintain records relating to the fumigation clearance of structures fumigated with a residential fumigant. Such records shall consist of the following information for each application:

1. Name and license number of the licensee responsible for the fumigant application;
2. Name of the person who applied the fumigant;
3. Date and time of the following: fumigant introduction, start of aeration, completion of aeration, and final testing for clearance;
4. Location of treatment site;
5. Detailed information relating to each label required clearance period including names of employees and personnel involved and start and stop times;
6. Total volume (cubic feet or other appropriate units) of the fumigated space;
7. Brand name or EPA registration number of the pesticide product applied; and,
8. Total amount in pounds or ounces, of fumigant and warning agent applied.

(b) Licensees or applicators operating in the category of fumigation shall use the Fumigation Log, (FDACS-13000, 01/17), which is hereby adopted and incorporated by reference and available online at <http://www.flrules.org/Gateway/reference.asp?No=Ref-07904>, while onsite. Licensees or applicators operating in the category of fumigation pursuant to section 482.111(2)(a), F.S., may use an alternative fumigation log form only if it incorporates all information required to be recorded in the current Fumigation Log, (FDACS-13000, 01/17). All licensees performing fumigation shall retain any records relating to the fumigation required by this rule for a period of two (2) years from the date of the fumigation. Upon request by the department, the licensee or certified operator in charge shall make available the records required to be maintained under this rule and shall permit the authorized representative to copy or photograph any of the records. The original records shall be maintained by the licensee.

(4) The required information shall be recorded no later than two (2) working days after the date of application and may be incorporated into other business transaction records.

(5) Reports:

(a) Each licensee shall immediately notify the department in writing of any loss or change of certified operator in charge of pest control activities, giving effective date. This shall also include notification of change while operating under an emergency certificate.

(b) Each licensee shall notify the department in writing within ten (10) working days of any change in firm name, business address, mailing address, telephone number, ownership status, termination or suspension or resumption of business activities, sale or transfer of any valid pest control contract(s) and change of certified operator's home address or telephone number.

(c) Termite or other wood-destroying organism inspection report:

Pursuant to sections 482.226(1), (2), (4) and (5), F.S., each licensee having a certified operator certified in the category of termite or other wood-destroying organism control and who makes and reports the findings of a wood-destroying organism inspection in writing shall provide the party requesting the inspection with the inspection findings on the Wood-Destroying Organisms Inspection Report, (FDACS-13645, Rev. 10/15), which is incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07320>, or the department's website under the header "Forms" at <http://www.freshfromflorida.com>. The licensee shall not place any disclaimers or additional language on the Wood-Destroying Organisms Inspection Report as incorporated by reference and adopted above. The licensee shall inspect for all wood-destroying organisms as defined in section 482.021(28), F.S., in accordance with the following inspection standards:

1. The inspection will include all areas accessible by normal means but does not cover those areas that are enclosed

or inaccessible, areas concealed by wall coverings, floor coverings, furniture, equipment, stored articles, insulation, or any portion of the structure in which inspection would necessitate removing or defacing any part of the structure.

2. The inspection will be visual but may include probing and sounding of structural members as deemed necessary by the inspector, based upon a preliminary finding of visual evidence of infestation or damage.

3. The inspection shall include an examination for visual evidence of wood-decaying fungi and damage caused by wood-decaying fungi. Wood-decaying fungi are fungi that can cause damage to wood, such as those that produce white rot, brown rot, poria, and cubical rot, but not surface molds that do not cause damage to sound wood.

(6) Advertising:

(a) Pest control advertising on service vehicles, in telephone directories or other advertising media shall in all cases be factual and shall be set forth only under the licensee's name or trade name registered with the Department. Unregistered fictitious names are prohibited.

(b) All pest control telephone directory advertising, including long distance lines shall in all cases show the licensee's name or trade name registered with the Department, complete licensed business location address from where services will be performed and telephone numbers.

(c) Solicitation and acceptance of pest control must be performed by an identification card holder whether performed in person or by telephone.

(7) A licensee shall notify its contract holders of any change in business location within thirty (30) days after the change and a sample copy of such notice shall be furnished to the Department.

(8) When a licensee acquires and becomes responsible for the pest control contracts of another licensee or former licensee he shall give written notice to all such contract holders within thirty (30) days, and shall furnish the Department with a list of the individual contracts acquired, or if applicable, a statement that all contracts of the other licensee or former licensee have been acquired.

(9) Business license application: In accordance with Section 482.071(1), F.S., the following information shall be submitted online at <http://www.FreshFromFlorida.com> or submit the Pest Control Business License Application, (FDACS-13605, Rev. 10/15), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07321>.

(a) A statement signed by the certified operator(s) in charge that all information given in Department business license application is true and correct and that he will promptly notify the Department in writing of any subsequent changes thereof, except change of home address and primary duty of identification card holders other than certified operators.

(b) The issuance fee for each original license shall be \$300. An applicant may request his application to be immediately expedited and processed by paying a special handling fee in the amount of \$50.

(c) The renewal fee for each original license shall be \$300.

(10) Any licensee who performs wood-destroying organism inspections in accordance with sections 482.226(1) and (6), F.S. shall show proof of meeting minimum financial responsibility at the time of license application or renewal thereof. Documented proof shall be in the form of an insurance certificate showing coverage for professional liability (errors and omissions), specifically covering wood-destroying organism inspection reports, in an amount no less than \$500,000 in the aggregate and \$250,000 per occurrence or proof of bond on a form acceptable to the State of Florida issued by the insurer in an amount no less than \$500,000 in the aggregate and \$250,000 per occurrence or a certified public accountant's notarized statement that a review or audit was performed on the licensee within one year of the license application and that the licensee's net worth or equity on the date of the audit or review was no less than \$500,000. No licensee shall perform wood-destroying organism inspections in accordance with sections 482.226(1) and (6), F.S. without meeting the required financial responsibility.

(11) Personal protective measures: All licensees shall provide their employees with personal protective clothing and equipment as directed on the registered label, and shall instruct employees to use such clothing and equipment while engaged in the application of pesticides.

(12) During the temporary absence of the certified operator currently in charge, the licensee may designate another certified operator, certified in the same categories as the certified operator in charge, to perform the duties that require the physical presence of a certified operator for a period of time not to exceed thirty (30) days. For the purpose of this

chapter, temporary absence shall mean any absence whereupon the certified operator in charge would reasonably be expected to return to his duties. The licensee shall notify the department in writing of any such temporary absence giving the name of the substituting temporary certified operator jointly responsible with the licensee, and the dates of the temporary absence.

Rulemaking Authority 482.051, 570.07(23) FS. Law Implemented 482.021(21), 482.032, 482.051(1), (5), 482.061, 482.071, 482.091, 482.111(5), (9), 482.161(1)(g), (h), 482.163, 482.226(1), (6), 482.2265 FS. History—New 1-1-77, Amended 6-27-79, 6-22-83, 1-20-87, 10-25-90, Formerly 10D-55.142, Amended 8-11-93, 5-28-98, 4-29-02, 4-17-03, 6-2-04, 6-1-06, 7-23-08, 9-17-08, 9-17-08, 1-4-09, 5-20-12, 1-9-17, 5-7-17, 2-27-19.

5E-14.1421 Identification Card – Training Verification.

(1) The licensee shall maintain written training records for both the initial five (5) day (40 hour) training required in section 482.091(3), F.S., and the continuing training required in section 482.091(10), F.S., on all identification cardholders within their employ and make those records available during routine inspection or upon request of the department. Licensees must maintain the training record for at least a two year period. The training required for section 482.091(3), F.S., must be conducted by a certified operator or a person under the supervision of the certified operator in charge who has been designated in writing as responsible for training. The 40 hour initial training shall be verified by:

(a) Completion of the Verification Record of Initial Employee Training, (FDACS-13665, Rev. 10/15), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07322>, or

(b) A written record of 40 hours of attendance in a training course with a written course syllabus and copies of all training materials used in the course available for department inspection.

(2) The department will accept either of the following as documentation of verifiable training as required under section 482.091(10), F.S.:

(a) Written record of attendance on Identification Cardholder Training Verification, (FDACS-13662, Rev. 10/15), which is incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07323>; and provided by the licensee or trainer, with a complete copy of all training materials used during the training session that covers the training topics required by section 482.091(10), F.S., or

(b) Written record of attendance at a department approved certified operator continuing education course on the Record of Attendance for Continuing Education Units (CEUs), (FDACS-13325, Rev. 05/04), as adopted in rule 5E-9.029, F.A.C., and provided by the trainer, only if the course content covers the training topics as required by section 482.091(10), F.S.

(3) For the purposes of complying with section 482.091(10), F.S., each classroom training session shall be at least 50 minutes in length or one contact hour. Partial contact hours will not be accepted. “Pesticide safety” deals with any aspect of pesticide formulation, handling and use. Example topics would include: pesticide types and formulations, human poisoning symptoms, routes of exposure and protective equipment, pesticide storage, transport and use, spray drift and groundwater runoff. “Integrated pest management” deals with any aspect of pest management. Example topics would include: inspection (locating and monitoring pests), establishing treatment thresholds, sanitation/habitat modification, trapping, biological and use of pesticides, and pesticide application equipment. “Applicable federal and state laws and rules” deal with any aspect of government regulation of the pest control industry. Example topics would include: reviewing federal FIFRA requirements, reviewing or discussing modifications to chapter 482, F.S. and/or chapter 5E-14, F.A.C., and reviewing other regulatory agencies or legislative bodies regulations dealing with pesticide use, hazardous waste storage/disposal and/or transportation.

(4) Licensees or certified operators applying for Wood-Destroying Organism Inspector Identification cards for employees in compliance with section 482.091(9), F.S., may complete the application process online at <http://www.FreshFromFlorida.com>, or shall submit the Special Training to Perform Wood-Destroying Organisms Inspections and Control Training Verification Record, (FDACS-13642, Rev. 10/15), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07324>, to the address as instructed on the form.

(5) Fumigation employees that participate in fumigations using a residential fumigant must complete Initial and Annual Stewardship Training as required by the label and Stewardship Policy for the residential fumigant(s) used as defined in Rule Chapter 5E-2, F.A.C. Information verifying Continuing Education Units for Stewardship Training (Initial or Annual) for all residential fumigant(s) used by the fumigation employee must be submitted to the department annually through <http://ceu.freshfromflorida.com>, or by submitting the Record of Attendance for Continuing Education Units (CEUs), Form FDACS-13325, Rev. 10/13, which is incorporated by reference in rule 5E-9.029, F.A.C., by electronic mail to biirfumigation@freshfromflorida.com, or facsimile to (850)617-7968 by the renewal date of the fumigation employee's identification card.

(6) The licensee or certified operator in charge of fumigation must apply for an identification card that identifies that employee as having received the training specified in paragraph 5E-14.108(3)(b), F.A.C., to assist as the second trained person during the use of a residential fumigant as described in subsection 5E-14.108(2), F.A.C. The application for such identification card with a fumigation endorsement must be accompanied by an affidavit, signed by the prospective identification cardholder and by the licensee or certified operator in charge for fumigation, which states that the prospective identification cardholder has received the training required by paragraph 5E-14.108(3)(b), F.A.C. Application shall be made online at <http://www.FreshFromFlorida.com>, or by submitting the Special Training to Perform Fumigation Affidavit (FDACS-13002, 01/17), which is hereby adopted and incorporated by reference and available online at <https://www.flrules.org/Gateway/reference.asp?No=Ref-07905>, to the address as instructed on the form in order to receive a Fumigation Identification Card endorsement on the employee's identification card as required by section 482.091, F.S. The identification cardholder must complete stewardship training as required by the label and Stewardship Policy for the residential fumigant(s) used within 60 days of receiving an identification card with a fumigation endorsement.

Rulemaking Authority 482.051, 482.091, 570.07(23) FS. Law Implemented 482.091, 482.151, 570.07(22) FS. History—New 6-12-02, Amended 2-24-09, 1-9-17, 5-7-17.

5E-14.149 Enforcement and Penalties.

(1) List of Penalties. The Department will apply one or more of the following penalties for violation of chapter 482, F.S., or chapter 5E-14, F.A.C., or as provided in section 482.161, F.S.

(a) Denial of an application for licensure or license renewal and/or permits or refusal of a pest control registration, license, and/or permit.

(b) Revocation or Suspension of any license including permits.

(c) Warning Letter.

(d) Probation for a specified period of time not to exceed two years subject to conditions.

(e) Administrative fine not to exceed \$5,000 for each violation.

(f) Criminal prosecution by referral to the State Attorney under sections 775.082 and 775.083, F.S.

(g) Injunctive relief.

(h) Issuance of a Cease and Desist Order, Immediate Stop Use or Stop Work Orders.

(i) Institution of an action under chapter 501, part II, sections 501.204, .207, .2075, .2077, .209, .211, .2105, .212, and .213, F.S., for violations involving deceptive and unfair trade practices where the legal remedies provided under chapter 501, part II, F.S., are needed to further protect consumers or recover damages associated with identified violations.

(2) Violation and Repeat Violation. Each and every breach of chapter 482, F.S., and related rules, or part thereof, is a violation. A repeat violation is a violation for which the person has been previously disciplined within the last three (3) years.

(3) Stop Use or Stop Work Orders.

(a) Use of Stop Use, Stop Work Orders shall be issued in accordance with subsection 5E-14.108(4), F.A.C., for: Fumigation activities performed in violation of fumigant label requirements or department rules, or in a manner that presents an immediate serious danger to the health, safety, or welfare of the public, including but not limited to, failure to use required personal protective equipment, failure to use required warning agent, failure to post required warning signs, failure to secure a structure's usual entrances as required, or using a fumigant in a manner that will likely result

in hazardous exposure to humans, animals, or the environment.

(b) The Department shall issue a release of a Stop Use or Stop Work Order when the deficiencies cited have been corrected and the violator is in compliance with the provisions of chapter 482, F.S., and associated rules.

(4) Default. A violator's failure to respond to an administrative complaint may result in a waiver of rights to a hearing and the Department may enter a Final Order imposing up to the maximum penalties as authorized by Florida law, including suspension of the violator's license and/or permit.

(5) Denial. The Department will deny application for licensure if:

(a) A person fails to comply with the licensing and/or permit requirements of chapter 482, F.S., or chapter 5E-14, F.A.C., or

(b) All outstanding fines owed to the Department are not paid in full unless the person seeking licensure has entered into a written settlement agreement with the Department to pay the fine, which has been filed with the agency clerk, and the person has made the payments timely as provided in the settlement agreement, or

(c) A person has been convicted of a crime under state or federal law that is directly related to standards determined by the Department, for which denial of licensure is necessary and reasonably related to the protection of the public health, safety, and welfare for the structural pest control business, including the following:

1. A felony or first degree misdemeanor under any state or federal law involving dishonesty, violence, destruction of property or sexual misconduct within the past three years.

2. A felony or first degree misdemeanor under any state or federal law, which is more than three (3) years old, involving dishonesty, violence, destruction of property or sexual misconduct and has not completed any sentence imposed by the court, unless the person has been released on probation and has complied with all the terms and conditions of probation.

3. A felony or first degree misdemeanor at any time under any state or federal law involving sexual misconduct with a minor child under the age of fourteen (14) years and the person has been classified as a sexual offender as defined in section 943.0435, F.S.

4. A felony or first degree misdemeanor at any time under state or federal law and the person has been classified as a sexual predator pursuant to section 775.21, F.S.

5. A felony or first degree misdemeanor under any state or federal law, which directly relates to the practice of pest control within the past three years.

6. A felony or first degree misdemeanor under any state or federal law, that is more than three years old, which directly relates to the practice of pest control and has not completed any sentence imposed by the court, unless the person has been released on probation and has complied with all the terms and conditions or probation.

(6) Notice of Noncompliance. Any department investigation or inspection which reveals minor violations of this rule chapter in which the department determines that the violator was unaware of the rule or unclear as to how to comply with it will result in the issuance of a notice of noncompliance as the department's first response to the minor violation. The following violations shall result in the issuance of a notice of noncompliance:

(a) Failure to comply with rule 5E-14.103, F.A.C.

(b) Failure to comply with rule 5E-14.105, F.A.C.

(c) Failure to comply with rule 5E-14.142, F.A.C.

(d) Failure to comply with rule 5E-14.1421, F.A.C., as it relates to the requirement that the licensee maintain written verification of all ID cardholder's initial and annual training.

(e) Failure to comply with rule 5E-14.147, F.A.C.

(f) Failure to comply with section 482.091(2)(c), F.S.

(g) Failure to comply with section 482.226(5), F.S.

(h) Failure to comply with section 482.227, F.S.

(7) Warning Letters. After failure to comply with a notice of noncompliance, a warning letter shall be issued for any violations classified in this rule as minor violations. A warning letter shall be issued for any first-time intermediate violation.

(8) Intermediate violations are all violations other than those classified as minor or major violations. Major violations are violations where:

(a) Death or serious bodily harm requiring medical attention to humans or veterinary attention to animals occurs as a result of misuse of a pesticide or mismanagement of another pest control method, and the injury or death is attributable to the misuse or mismanagement.

(b) Misuse of a highly toxic pesticide (Category I, Danger signal word) as established in 40 CFR 156.64(a), is documented and such a misuse could result in death or serious bodily harm to humans or animals, but where the death or injury did not occur.

(c) The licensee, certificate holder, permit holder or applicator causes serious harm to an ecological system, or contamination of water or soil requiring corrective action or monitoring to protect human or animal health or the environment as a result of misuse of a pesticide or mismanagement of another pest control method.

(d) The licensee, certificate holder, permit holder or applicator deliberately makes false or fraudulent claims with respect to pest control, deliberately misrepresents the effects of materials or methods used in pest control, or deliberately fails to use materials or methods suitable for the pest control undertaken.

(e) The licensee, certificate holder, permit holder or applicator performs pest control in a manner that causes harm due to carelessness or failure to exercise proper care in the use of a pesticide or other pest control technique; fails to comply with subsection 5E-14.106(6), (7), or (8), F.A.C.; or uses a fumigant in a manner that is inconsistent with its label directions or the requirements of rule 5E-14.108, 5E-14.110, 5E-14.111, 5E-14.112, or 5E-14.113, F.A.C.

(f) The licensee, certificate holder, permit holder or applicator fails to give the Department or department representative true information in response to a written request within 14 business days regarding methods and materials used, work performed, or other information essential to the administration of chapter 482, F.S.

(g) The licensee, certificate holder, permit holder or applicator performs or causes fraudulent or misleading advertising relative to pest control or advertises in an unauthorized category of pest control.

(h) The licensee, certificate holder, permit holder or applicator misuses a pesticide, performs a faulty inspection for wood destroying organisms, or fails to comply with the terms of a wood destroying organism protection contract, and such action results in property damage exceeding \$2,500.

(i) The licensee, certificate holder, permit holder or applicator violates any Immediate Final Order, Emergency Suspension Order, Stop Use, Stop Work, Settlement Agreement, Consent Order, Final Order, or any other order of the Department, issued under the authority of chapter 120 or 482, F.S., or chapter 5E-14, F.A.C.

(j) The licensee, certificate holder, permit holder or applicator commits fraud or deceptive trade practices.

(k) An individual or business performs pest control without holding a valid license from the Department.

(l) A licensee or certified operator fails to comply with section 482.091(1) or (2)(a), (d), and (e), F.S.

(m) A licensee or certified operator fails to comply with section 482.121, F.S.

(9) Fines. For repeat minor or intermediate violations, multiple violations including at least one major violation, and all major violations, including those violators who do not respond to an administrative complaint, the Department will impose an administrative fine not to exceed \$5,000 per violation plus any other penalty allowed by law including suspension or revocation. When imposing a fine, the Department will consider the degree and extent of harm, or potential harm, that was or could have been caused by the violation, the cost of rectifying the damage minus the actions taken by the licensee or certified operator or applicator to correct the violation or remedy complaints, whether the violation was committed willfully, the compliance record of the violator, and the costs to the Department of investigating the violation. The Department will use the Fine Guide as set out in subsection (15) to assist in determining the appropriate amount of the fine.

(10) Suspension and Revocation.

(a) Suspension will be imposed when:

1. The violation results in death of humans or domestic animals or pets, or injury requiring hospitalization to humans.

2. The violation results in serious harm to an ecological system, or contamination of water or soil requiring corrective action or monitoring to protect human health or the environment.

3. The compliance record of the violator shows two or more prior violations for similar major violations within the last three (3) years.

4. The licensee, certificate holder, permit holder or applicator has habitual intemperance or addiction to narcotics

to the extent that it contributes substantially to the occurrence of violations of chapter 482, F.S.

5. A person has obtained licensure of any kind under chapter 482, F.S., and the Department subsequently determines that the person that is the holder of the licensure falls into any of the categories set forth in paragraph (5)(c), above, that would be cause for denying licensure.

6. A licensee or certificate holder has been found by the Department to be in violation of section 482.121, F.S.

7. When a permit holder pursuant to section 482.0815(4) or (6), F.S., meets the conditions therein.

(b) Revocation will be imposed when:

1. A violator does not comply with a suspension order, or if a licensee or certificate holder has been suspended twice in three years.

2. A person has obtained licensure of any kind under chapter 482, F.S., and the Department subsequently determines that the person that is the holder of the licensure falls into any of the categories set forth in paragraph (5)(c), above, that would be grounds for denying licensure under chapter 482, F.S., and the person will not be able to correct or cure the grounds for denying licensure within a period of two years.

(11) Quarterly List. All disciplinary actions taken by the Department pursuant to chapter 482, F.S., or the rules adopted pursuant to it, shall be published in the next available quarterly list published as required in section 482.161(9), F.S., and on the Department's website and shall include the identity of each individual or entity against which disciplinary action was taken, and a brief description of the offense and the disciplinary action, whether it was a warning letter, fine, probation, suspension or revocation. If the violator operated an unlicensed pest control business the name of the unlicensed business will also be listed.

(12) Resolution of Violations, Settlement, and Additional Enforcement Remedies. The Department and the violator may agree to resolve violations before administrative action, or to enter into settlement pursuant to section 120.57(4), F.S. The willingness of a violator to resolve violations before initiation of administrative action, or to settle will be considered in determining the appropriate penalty because early resolution of violations furthers compliance and results in savings of time, costs, and expenses for the Department. The Department will enforce a failure to comply with an agreement to resolve violations or a settlement agreement with the penalties and remedies provided in the agreement as authorized by law. These enforcement guidelines shall not be construed to limit the authority of the Department to resolve violations before or after initiation of any administrative action or to settle with any party. The Department may utilize all available remedies to ensure voluntary compliance including administrative action, civil actions, referrals for criminal prosecution, and deceptive and unfair trade practices actions pursuant to chapter 501, F.S.

(13) Follow-Up Compliance Inspections. If the violator agrees to corrective actions and subsequent inspection reveals that corrective actions have not been taken or that good faith efforts to undertake these corrective actions have not been made, then the Department will enforce the penalties and remedies provided in the agreement and as authorized by law.

(14) Notification of Licensees, Certificate Holders, and Identification Card Holders of Complaint. When the Department receives a written complaint from a consumer regarding a licensee, certificate holder, permit holder or applicator, the Department will send a notice to the responsible person and to the licensee, stating the complaint, identifying the complainant and requesting a written response within 10 working days.

(15) Fine Guide. FINE GUIDE = A(B+C+D+E+F)G. This guide shall apply for each violation for which a fine is imposed. The maximum fine is \$5,000 per violation. The terms and values used in the fine guide calculation shall be:

A = Degree & Extent of Harm – Human, animal and environmental hazards occur as a result of pesticide misuse or mismanagement of another pest control method:

1 Human, animal or environmental harm not identified

5 Death of animals or injury to humans or animals requiring hospitalization, or serious harm to an ecological system, or contamination of water or soil requiring corrective action or monitoring to protect human health or the environment

7 Human death

B = Toxicity of the pesticide for which a pesticide misuse or violation, of label directions which could result in human or animal hazards:

0	No pesticide involved in complaint
1	Category III or IV – Signal Word “Caution”
2	Category II – Signal Word “Warning”
3	Category I – Signal Word “Danger”
C =	Estimated cost of rectifying the damage to consumer minus any mitigation provided by the violator
1	Unknown or under \$1,000
2	Over \$1,000 and under \$5,000
3	Over \$5,000 and under \$10,000
4	Over \$10,000
D =	Whether the violation was committed deliberately
1	No evidence violation was committed deliberately
5	Evidence violation was committed deliberately
E =	Compliance record of the violator
0	No prior violations
1	One prior violation for a dissimilar violation
2	Two or more prior violations dissimilar to current violation
3	One prior violation for a similar violation
4	Two or more prior violations for similar violations
F =	Investigative Costs
0	Routine investigation or Payment of all investigative costs
2	Violation documented as a result of more than one inspection or requiring investigation by multiple inspectors, or by department personnel outside of the division of Agricultural Environmental Services
G =	Entity Category
500	Business licensee responsible for violation, or person operating a pest control business without a valid business license
250	Certified Operator or Special Identification Cardholder responsible for violation
100	All others

Compliance record. The compliance record is established by prior disciplined violations, within the three (3) years preceding the date of the current violation, of chapter 482, F.S., or of chapter 5E-14, F.A.C., or of federal or other Florida law addressing pest control or pesticide use or disposal. Violations will be considered final on acceptance of the applicable penalty, or the date of final agency action or the conclusion of any appeals thereof.

Rulemaking Authority 482.051, 570.07(23) FS. Law Implemented 112.011, 120.695, 482.121, 482.161, 482.163 FS. History—New 7-13-06, Amended 7-11-07, 8-4-08, 5-20-12, 2-27-19.

5E-14.150 Customer Contact Centers.

(1) Customer Contact Center business license application: In accordance with section 482.072(2)(a), F.S., an applicant for a customer contact center business license shall submit a completed Pest Control Customer Contact Center License Application form, FDACS-13686 Rev 03/12, and application fee of \$600 in the form of a check or money order payable to the Florida Department of Agriculture and Consumer Services (FDACS) to the address indicated on the form. Form FDACS-13686 Rev 03/12, is hereby adopted and incorporated by reference and may be obtained by visiting <http://www.flrules.org/Gateway/reference.asp?No=Ref-01051>.

(2) In accordance with section 482.072(3)(a), F.S., the following requirements and procedures for recordkeeping and monitoring of customer contact center operations are established.

(a) Each licensed customer contact center shall maintain a digital audio, compact disk, or tape recording of inbound and outbound telephone calls between the customer contact center and consumers located in Florida. These records must be retained for a minimum period of 6 months and are subject to inspection by Department representatives upon request.

(b) A licensed customer contact center premises shall be made available to Department representatives upon request for inspection purposes during normal business hours and to monitor live calls from consumers located in

Florida.

(c) A licensed customer contact center shall have a procedure in place to identify a specific telephone call by consumer name, date of call, or customer address and identify which customer contact center employee handled a telephone call with a specific consumer identified by a Department representative.

(d) A licensed customer contact center shall have a procedure in place to provide records relating to customer contacts and the required procedures set forth in paragraphs (a), (b), and (c), above, to Department representatives upon request and provide an accounting of inbound and outbound calls with Florida consumers and identify the number of outbound center initiated calls.

(e) Each licensed customer contact center shall designate a "Primary Contact Person" at the licensed location for purposes of communication with the Department. The name, email address (if any), and telephone number of the primary contact person shall be provided to the Department as part of the license application adopted by subsection (1). If the Primary Contact person changes before license renewal, the new contact information shall be submitted to the Department by calling (850) 617-7997.

(3) A Customer Contact Center License Renewal date shall be two years from the date of the original license issuance or renewal thereof. The renewal fee for each original license shall be \$600.

(4) After a grace period of 30 days following the renewal date, a late fee of \$150 shall be assessed in addition to the renewal fee.

Rulemaking Authority 482.051, 482.072 FS. Law Implemented 482.072 FS. History—New 5-20-12.

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FLORIDA STATUTE: CHAPTER 482: PEST CONTROL

482.021 Definitions

For the purposes of this chapter, and unless otherwise required by the context, the term:

- (1) “Agricultural area” means an area:
 - (a) Upon which a ground crop, trees, or plants are grown for commercial purposes;
 - (b) Where a golf course, park, nursery, or cemetery is located; or
 - (c) Where farming of any type is performed or livestock is raised.
- (2) “Business location” means an advertised permanent location in or from which pest control business is solicited, accepted, or conducted.
- (3) “Category” means a distinct branch or phase of pest control for which a pest control operator’s certificate may be issued such as: fumigation, general household pest control, termites and other wood-destroying organisms pest control, lawn and ornamental pest control, and such a combination or division of such branches of pest control as the department may by rule establish.
- (4) “Certified operator” means an individual holding a current pest control operator’s certificate issued by the department.
- (5) “Certified operator in charge” means a certified operator:
 - (a) Whose primary occupation is the pest control business;
 - (b) Who is employed full time by a licensee; and
 - (c) Whose principal duty is the personal supervision of the licensee’s operation in a category or categories of pest control in which the operator is certified.
- (6) “Commercial fertilizer application” means the application of fertilizer for payment or other consideration to property not owned by the person or firm applying the fertilizer or the employer of the applicator.
- (7) “Department” means the Department of Agriculture and Consumer Services.
- (8) “Employee” means a person who is employed by a licensee that provides that person with necessary training, supervision, pesticides, equipment, and insurance and who receives compensation from and is under the personal supervision and direct control of the licensee’s certified operator in charge and from whose compensation the licensee regularly deducts and matches federal insurance contributions and federal income and Social Security taxes.
- (9) “Fumigant” means a chemical which, at a required temperature and pressure, can exist in the gaseous state in sufficient concentration to be lethal to a given organism. This definition implies that a fumigant acts as a gas in the strictest sense of the word. This definition excludes aerosols that are particulate suspensions of liquids or solids dispersed in air.
- (10) “Fumigation” means the use, within an enclosed space or in or under a structure or tarpaulins, of a fumigant in concentrations that may be hazardous to human beings.
- (11) “General household pest control” means pest control with respect to any structure, not including fumigation or pest control with respect to termites and other wood-destroying organisms.
- (12) “Identification cardholder” means an owner or employee to whom a current card has been issued by the department identifying the holder to the public or to any law enforcement officer or any agent of the department charged with, or entitled to exercise any function in connection with, the enforcement of this chapter and any rules made pursuant to this chapter.
- (13) “Independent contractor” means an entity separate from the licensee that:
 - (a) Receives moneys from a customer which are deposited in a bank account other than that of the licensee;
 - (b) Owns or supplies its own service vehicle, equipment, and pesticides;
 - (c) Maintains a business operation, office, or support staff independent of the licensee’s direct control;
 - (d) Pays its own operating expenses such as fuel, equipment, pesticides, and materials; or
 - (e) Pays its own workers’ compensation as an independent contractor.
- (14) “Infestation” means the presence of living pests in, on, or under a structure, lawn, or ornamental.
- (15) “Integrated pest management” means the selection, integration, and implementation of multiple pest control techniques based on predictable economic, ecological, and sociological consequences, making maximum use of naturally occurring pest controls, such as weather, disease agents, and parasitoids, using various biological,

physical, chemical, and habitat modification methods of control, and using artificial controls only as required to keep particular pests from surpassing intolerable population levels predetermined from an accurate assessment of the pest damage potential and the ecological, sociological, and economic cost of other control measures.

(16) "Lawn" means the turf formed from grass or other plants.

(17) "Lawn and ornamental pest control" means pest control with respect to pests of any lawn or ornamental.

(18) "Licensee" means a person, partnership, firm, corporation, or other business entity having a license issued by the department for engaging in the business of pest control at a particular business location.

(19) "New construction" means the erection of a new building or the construction of an addition to an existing building, which encloses a space and requires a building permit under applicable building codes.

(20) "Ornamental" means any shrub, bush, tree or other plant used or intended for use:

(a) In connection with the occupation or use of any structure; or

(b) By human beings for purposes other than in an agricultural area.

(21) "Pest" means an arthropod, wood-destroying organism, rodent, or other obnoxious or undesirable living plant or animal organism.

(22) "Pest control" includes:

(a) The use of any method or device or the application of any substance to prevent, destroy, repel, mitigate, curb, control, or eradicate any pest in, on, or under a structure, lawn, or ornamental;

(b) The identification of or inspection for infestations or infections in, on, or under a structure, lawn, or ornamental;

(c) The use of any pesticide, economic poison, or mechanical device for preventing, controlling, eradicating, identifying, inspecting for, mitigating, diminishing, or curtailing insects, vermin, rodents, pest birds, bats, or other pests in, on, or under a structure, lawn, or ornamental;

(d) All phases of fumigation, including:

1. The treatment of products by vault fumigation; and

2. The fumigation of boxcars, trucks, ships, airplanes, docks, warehouses, and common carriers; and

(e) The advertisement of, the solicitation of, or the acceptance of remuneration for any work described in this subsection, but does not include the solicitation of a bid from a licensee to be incorporated in an overall bid by an unlicensed primary contractor to supply services to another.

(23) "Pesticide or economic poison" means any substance or mixture of substances intended for:

(a) Preventing, destroying, repelling, or mitigating any insects, rodents, nematodes, fungi, weeds, or other forms of plant or animal life or viruses, except viruses or fungi on or in living human beings or other animals; or

(b) Use as a plant regulator, defoliant, or desiccant.

(24) "Rodent" means a rat, mouse, squirrel, or flying squirrel or other animal of the order Rodentia, including a bat, which may become a pest in, on, or under a structure.

(25) "Rodent control" means application of remedial measures for the purpose of controlling rodents.

(26) "Special identification cardholder" means a person to whom an identification card has been issued by the department showing that the holder is authorized to perform fumigation.

(27) "Structure" means:

(a) Any type of edifice or building, together with the land thereunder, the contents thereof, and any patio or terrace thereof;

(b) That portion of land upon which work has commenced for the erection of an edifice or building; or

(c) A railway car, motor vehicle, trailer, barge, boat, ship, aircraft, wharf, dock, warehouse, or common carrier.

(28) "Termites and other wood-destroying organisms pest control" means pest control with respect to any termite or other wood-destroying organisms, including fungi, by the use of any chemical or mechanical methods, including moisture control for the prevention or control of fungus in existing structures, but not including fumigation or general household pest control.

(29) "Urban landscape" means pervious areas on residential, commercial, industrial, institutional, highway rights-of-way, or other nonagricultural lands that are planted with turf or horticultural plants. For the purposes of this section, agriculture has the same meaning as in s. 570.02.

(30) "Wood-destroying organism" means arthropod or plant life which damages and can reinfest seasoned wood in a structure, namely termites, powder-post beetles, old house borers, and wood-decaying fungi.

482.051 Rules

The department may adopt rules to implement the provisions of this chapter. Before proposing the adoption of a rule, the department shall counsel with members of the pest control industry concerning the proposed rule. The department shall adopt rules for the protection of the health, safety, and welfare of pest control employees and the general public which require:

(1) That all pesticides or economic poisons be used only in accordance with the registered labels and labeling or as directed by the United States Environmental Protection Agency or the department.

(2) That vehicles and trailers used in pest control be permanently marked with the licensee's name that is registered with the department. However, vehicles that are used to perform only sales and solicitation may have temporary or removable markers.

(3) That written contracts be required for providing termites and other wood-destroying organisms pest control, that provisions necessary to assure consumer protection as specified by the department be included in such contracts, and that require licensees to comply with the contracts issued.

(4) That a licensee, before performing general fumigation, notify in writing the department of the location where the fumigation is to be performed, which notice must be received by the department at least 24 hours before the fumigation and must contain such information as the department requires. The department may specify circumstances under which notification of less than 24 hours is allowed and what notice is required in those circumstances.

(5) That any pesticide used as the primary preventive treatment for subterranean termites in new construction be applied in the amount, concentration, and treatment area in accordance with the label; that a copy of the label of the registered pesticide being applied be carried in a vehicle at the site where the pesticide is being applied; and that the licensee maintain for 3 years the record of each preconstruction treatment, indicating the date of treatment, the location or address of the property treated, the total square footage of the structure treated, the type of pesticide applied, the concentration of each substance in the mixture applied, and the total amount of pesticide applied.

(6) That the department may issue an immediate stop-use or stop-work order for fumigation performed in violation of fumigant label requirements or department rules, or in a manner that presents an immediate serious danger to the health, safety, or welfare of the public, including, but not limited to, failure to use required personal protective equipment, failure to use a required warning agent, failure to post required warning signs, failure to secure a structure's usual entrances as required, or using a fumigant in a manner that will likely result in hazardous exposure to humans, animals, or the environment.

(7) That the department may require safety procedures for the clearance of residential structures before reoccupation after fumigation.

482.071 Licenses

(1) The department may issue licenses to qualified businesses to engage in the business of pest control in this state. It is unlawful for any person to operate a pest control business that is not licensed by the department.

(2)(a) Before entering business or upon transfer of business ownership, and also annually thereafter, on or before an anniversary date set by the department for each licensed business location, each person, partnership, firm, corporation, or other business entity engaged in pest control must apply to the department for a license, or a renewal thereof, for each of its business locations. Applications must be made on forms prescribed and furnished by the department.

(b) The department shall establish a fee for the issuance of a license, which fee may not be more than \$300 or less than \$75, and a fee for the renewal of a license, which fee may not be more than \$300 or less than \$75; however, until rules setting these fees are adopted by the department, the issuance fee and renewal fee shall each be \$75. After a grace period not exceeding 30 calendar days following the anniversary renewal date, the department shall assess a late renewal charge of \$50, which must be paid in addition to the renewal fee. The aggregate of the fees assessed pursuant to this paragraph may not exceed 105 percent of the direct costs for administering this chapter.

(c) Unless timely renewed, a license automatically expires 60 calendar days after the anniversary renewal date. Subsequent to such expiration, a license may be reinstated only upon reapplication and payment of the issuance fee and the late renewal fee.

(d) A license automatically expires when a licensee changes its business location address or its business name as registered with the department. The department shall issue a new license for the remainder of the term upon payment of a fee of \$25.

(e) The department may not issue or renew a license to engage in the pest control business unless the applicant's pest control activities are under a certified operator or operators in charge who are certified in the categories of the licensee.

(f) The department by rule may establish a procedure for expediting the processing of an application for license upon payment by the applicant of a special fee in an amount sufficient to cover the cost of such expedited process, but not exceeding \$50.

(g) The department may deny the issuance of a pest control business license to any applicant, or refuse to renew the license of any licensee, if the department finds that the applicant or licensee or any of its directors, officers, owners, or general partners are or were directors, officers, owners, or general partners of a pest control business which has gone out of business or sold the business to another party within 5 years immediately preceding the date of application or renewal and failed to reimburse the prorated value of its customers' remaining contract periods or failed to provide for another licensed pest control operator to assume its existing contract responsibility.

(3) A licensee shall display its current license at each of its business locations. Each business location of a licensee must be licensed.

(4) A licensee may not operate a pest control business without carrying the required insurance coverage. Each person making application for a pest control business license or renewal thereof must furnish to the department a certificate of insurance that meets the requirements for minimum financial responsibility for bodily injury and property damage consisting of:

(a) Bodily injury: \$250,000 per person and \$500,000 per occurrence; and property damage: \$250,000 per occurrence and \$500,000 in the aggregate; or

(b) Combined single-limit coverage: \$500,000 in the aggregate.

(5) A license under this section is a prerequisite for the issuance of a local occupational license to engage in pest control, as provided in s. 205.1967.

482.132 Qualifications for examination and certification

(1) The department may award a pest control operator's certificate to an individual who has passed the examinations prescribed by the department and who submits to the department proof that she or he is not under the disability of minority and is qualified to be a certified operator with regard to the safety of persons and property, and is otherwise qualified under the provisions of this chapter and the rules made pursuant to this chapter.

(2) Each applicant for examination for a pest control operator's certificate must possess the minimum qualifications specified in one of the following paragraphs:

(a) Three years' employment as a service employee of a licensee that performs pest control in the category or categories in which the applicant seeks certification, 1 year of which employment must have been completed in this state during the year immediately preceding application for examination.

(b) A degree with advanced training or a major in entomology, botany, agronomy, or horticulture from a recognized college or university, which training or major included the completion of at least 20 semester hours or 30 quarter hours of college credits in those subjects, plus 1 year's employment as a service employee of a licensee that performs pest control in the category or categories in which the applicant seeks certification or the successful completion of a 1-year entomology program at a public university in this state which specializes in urban pest management and includes practical pest management experience. If such advanced training or major is in entomology, the applicant is qualified for examination in all categories; but if such advanced training or major is in botany, agronomy, or horticulture, the applicant is qualified for examination only in the category of lawn and ornamental pest control.

(c) A 2-year degree in horticultural technology or the equivalent from a college or university, with advanced training of 20 or more semester hours or 30 or more quarter hours of credit in horticulture, plus 1 year's employment as a service employee of a licensee that performs pest control only in the category of lawn and ornamental pest control. Such an applicant is qualified for examination only in the category of lawn and ornamental pest control.

(d) A 2-year degree in general pest control technology or the equivalent from a college or university, with advanced training of 20 or more semester hours or 30 or more quarter hours of credit in entomology, plus 1 year of employment as a service employee of a licensee that performs pest control in any category or categories. Such an applicant is qualified for all examinations.

(e) Twenty-four semester hours or 36 quarter hours of courses in entomology, pest control technology, and related subjects, plus 1 year of employment as a service employee of a licensee that performs pest control in the category of general household pest, termite, and fumigation. Such an applicant is qualified only for examination in

the categories of general household pest control, termite and other wood-destroying organisms pest control, and fumigation.

(f) Twenty-four semester hours or 36 quarter hours of courses in entomology, pest control technology, agronomy, botany, horticulture, and related subjects, plus 1 year of employment as a service employee of a licensee that performs pest control in the category of lawn and ornamental pest control. Such an applicant is qualified only for examination in the category of lawn and ornamental pest control.

(g) Three years' full-time employment as a service employee of the United States Department of Defense, who has been certified to perform pest control in the category or categories in which the applicant seeks certification, 1 year of which employment must have been completed in this state during the year immediately preceding application for examination. Additionally, the application for certification must be submitted to the Department of Agriculture and Consumer Services within 12 months after the date of termination of employment from the Department of Defense.

(3) In addition, each applicant must have knowledge of practical and scientific facts of pest control and be a graduate of an accredited high school or submit to the department satisfactory evidence of equivalent education.

482.141 Examinations

(1) Each individual seeking certification must satisfactorily pass an examination which must be written but which may include practical demonstration. The department shall hold at least two examinations each year. An applicant may seek certification in one or more categories.

(2) An application for examination must be made in accordance with the rules of the department. Each application must be accompanied by a fee set by the department, in an amount of not more than \$300 or less than \$150, for each category in which the applicant desires to be examined; however, until rules setting these fees are adopted by the department, the examination fee for each category shall be \$150. Any applicant who fails to pass one or more categories may reapply for examination upon the payment of the applicable fee for each category in which the applicant seeks reexamination.

(3) The department shall give an examination in each category for which application is made which tests the applicant's knowledge of pest control as applicable to that category. The certificate issued must state the categories allowed thereby.

(4) A refund of examination fees may not be made unless the applicant presents written evidence that she or he was under military orders, on jury duty or otherwise subpoenaed, or under medical care which precluded reporting to take the examination, in which case the department shall exercise its discretion as to a refund.

482.151 Special identification card for performance of fumigation

(1) Any individual who performs fumigation must be a special identification cardholder, unless such individual is a certified operator who is certified in the category of fumigation. When performing fumigation, a special identification cardholder or certified operator may act only under the direction and supervision of the certified operator in charge.

(2) The department shall prescribe by rule the qualifications, privileges, duties, and limitations of holders of special identification cards.

(3) The department may issue special identification cards to qualified individuals who pass written examinations that may include practical demonstration. The application forms shall be prescribed by the department.

(4) The department, in its rules, shall provide for such matters as required qualifications for applicants for examination, written or practical phases or categories of examinations, and time of examinations. The fee for an examination shall be set by the department but may not be more than \$200 or less than \$100 for each category; however, until rules setting these fees are adopted by the department, the fee for each category shall be \$100.

(5) An application must be made and the issuance fee paid to the department for an original special identification card within 60 days after the postmark date of written notification of passing the examination. The fee for issuance of an original special identification card shall be set by the department but may not be more than \$100 or less than \$50; however, until a rule setting this fee is adopted by the department, the fee shall be \$50. During a period of 30 days following expiration of the 60-day period, an original special identification card may be issued; however, the department shall assess a late issuance charge of \$25, which must be paid in addition to the issuance

fee. An original special identification card may not be issued after expiration of the 30-day period, without reexamination.

(6) An application to the department for renewal of a special identification card must be made on or before an anniversary date set by the department. The fee for renewal of a special identification card shall be set by the department but may not be more than \$100 or less than \$50; however, until a rule setting this fee is adopted by the department, the renewal fee shall be \$50. After a grace period not exceeding 30 calendar days following such renewal date, the department shall assess a late renewal charge of \$25, which must be paid in addition to the renewal fee.

(7) Unless timely renewed, a special identification card automatically expires 180 calendar days after the anniversary renewal date. Subsequent to such expiration, a special identification card may be issued only upon successful reexamination and upon payment of examination and issuance fees due, as provided in this section.

(8) Before the expiration date of a special identification card, the cardholder must:

(a) Complete 2 hours of approved continuing education on legislation, safety, and pesticide labeling and 2 hours of approved continuing education in the fumigation category; or

(b) Pass an examination in fumigation given by the department.

(9) If a special identification cardholder becomes a member of the Armed Forces of the United States on active duty, the renewal fee and continuing education requirements are waived while the individual remains on active duty as a member of the Armed Forces.

482.152 Duties of certified operator in charge of pest control activities of licensee

A certified operator in charge of the pest control activities of a licensee shall have her or his primary occupation with the licensee and shall be a full-time employee of the licensee, and her or his principal duty shall include the responsibility for the personal supervision of and participation in the pest control activities at the business location of the licensee as the same relate to:

- (1) The selection of proper and correct chemicals for the particular pest control work performed.
- (2) The safe and proper use of the pesticides used.
- (3) The correct concentration and formulation of pesticides used in all pest control work performed.
- (4) The training of personnel in the proper and acceptable methods of pest control.
- (5) The control measures and procedures used.
- (6) The notification of the department of any accidental human poisoning or death connected with pest control work performed on a job she or he is supervising, within 24 hours after she or he has knowledge of the poisoning or death.

482.226 Wood-destroying organism inspection report; notice of inspection or treatment; financial responsibility

(1) When an inspection for wood-destroying organisms is made by a licensee for purposes of a real estate transaction and either a fee is charged for the inspection or a written report is requested by the customer, a wood-destroying organism inspection report shall be provided by the licensee or its representative qualified under this chapter to perform such inspections. The inspection shall be made in accordance with good industry practice and standards as established by rule and must include inspection for all wood-destroying organisms. The inspection findings shall be reported to the person requesting the inspection. The report must be made on a form prescribed by the department and furnished by the licensee. A copy of the inspection report shall be retained by the licensee for a period of not less than 3 years.

(2)(a) The inspection report must include the following information and statements:

1. The licensee's name.
2. The date of the inspection.
3. The address of the structure inspected.
4. Any visible accessible areas not inspected and the reasons for not inspecting them.
5. The areas of the structure that were inaccessible.
6. Any visible evidence of previous treatments for, or infestations of, wood-destroying organisms.
7. The identity of any wood-destroying organisms present and any visible damage caused.

8. A statement that a notice of the inspection has been affixed to the property in accordance with subsection (4) or subsection (5) and a statement of the location of the notice.
- (b) If any pest control treatment is provided at the time of the inspection, the inspection report must also provide the name of each of the wood-destroying organisms for which treatment was provided, the name of the pesticide used, and all conditions and terms associated with that treatment.
- (c) An inspection report does not constitute a guarantee of the absence of wood-destroying organisms or damage therefrom or other evidence unless the report specifically states therein the extent of such guarantee.
- (d) The inspection report must also include a statement certifying that neither the inspector nor the licensee by whom the inspection is made has any financial interest in the property inspected or is associated in any way in the transaction with any party to the transaction other than for inspection purposes.
- (3) If periodic reinspections or retreatments are specified in wood-destroying organisms preventive or control contracts, the licensee shall furnish the property owner or the property owner's authorized agent, after each such reinspection or retreatment, a signed report indicating the presence or absence of wood-destroying organisms covered by the contract, whether retreatment was made, and the common or brand name of the pesticide used. Such report need not be on a form prescribed by the department. A person may not perform periodic reinspections or retreatments unless she or he has an identification card issued under s. 482.091(9).
- (4) When a wood-destroying organism inspection is provided in accordance with subsection (1), the licensee shall post notice of such inspection immediately adjacent to the access to the attic or crawl area or other readily accessible area of the property inspected. This notice must be at least 3 inches by 5 inches in size and must consist of a material that will last at least 3 years. It is a violation of this chapter for anyone other than the property owner to remove such notice at any time. The licensee's name and address and the date of inspection must be stated on the notice.
- (5) In addition to the notice required by subsection (4), any licensee who performs control of any wood-destroying organism shall post notice of such treatment immediately adjacent to the access to the attic or crawl area or other readily accessible area of the property treated. This notice must be at least 3 inches by 5 inches in size and must consist of a material that will last at least 3 years. It is a violation of this chapter for anyone other than the property owner to remove such notice at any time. The licensee's name and address, the date of treatment, the name of the pesticide used, and the wood-destroying organism for which treatment was performed must be stated on the notice. The contract for treatment between the licensee and the consumer must state the location of such notice.
- (6) Any licensee that performs wood-destroying organism inspections in accordance with subsection (1) must meet minimum financial responsibility in the form of errors and omissions (professional liability) insurance coverage or bond in an amount no less than \$500,000 in the aggregate and \$250,000 per occurrence, or demonstrate that the licensee has equity or net worth of no less than \$500,000 as determined by generally accepted accounting principles substantiated by a certified public accountant's review or certified audit. The licensee must show proof of meeting this requirement at the time of license application or renewal thereof.

482.243 Pest Control Enforcement Advisory Council

- (1) The Pest Control Enforcement Advisory Council is created within the department. The Commissioner of Agriculture shall appoint all members of the council. The purpose of the council is to advise the Commissioner of Agriculture regarding the regulation of pest control practices and to advise government agencies with respect to those activities related to their responsibilities regarding pest control. The council shall serve as the statewide forum for the coordination of pest control related activities to eliminate duplication of effort and maximize protection of the public.
- (2) The council shall consist of 11 members as follows: a representative of the department; a citizen not involved in the conduct of pest control; a state university urban entomologist; and eight persons each holding a pest control operator's certificate issued under s. 482.111, of whom two shall be actively involved in termite control, two shall be actively involved in general household pest control, two shall be actively involved in structural fumigation, and two shall be actively involved in lawn and landscape pest control. Each member shall be appointed for a term of 4 years and shall serve until a successor is appointed.
- (3) In conducting its meetings, the council shall use Robert's Rules of Order. A majority of the members of the council constitutes a quorum for all purposes, and an act by a majority of such quorum at any meeting constitutes an official act of the council. The secretary shall keep a complete record of each meeting which must show the names of members present and the actions taken. These records must be kept on file with the department, and these records

and other documents about matters within the jurisdiction of the council are subject to inspection by members of the council.

(4) The members of the council shall meet and organize by electing a chair, a vice chair, and a secretary whose terms shall be for 1 year each. Council officers may not serve consecutive terms.

(5) The council shall meet at the call of its chair, at the request of a majority of its members, at the request of the department, or at such time as a public health or environmental emergency arises.

(6) The meetings, powers and duties, procedures, and recordkeeping of the council shall be pursuant to s. 570.232.

(7) The council shall receive reports of pest control enforcement activity conducted by the Division of Agricultural Environmental Services, which shall include numbers of cases, numbers of administrative actions, numbers of complaints received and investigated, and dispositions of complaints; provide advice to the department on the conduct of pest control enforcement activities; receive reports on disciplinary actions, provided that the names of individual licensees shall be expunged from cases discussed before the council, unless a consent order or final order has been issued in the case; and make recommendations, subject to a majority vote, directly to the Commissioner of Agriculture for actions to be taken with respect to the regulation of pest control services and practices that the council has reviewed.

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