

CHAPTER 4

Using Pesticides Safely

Learning Objectives

- ✓ Mix pesticides safely
- ✓ Apply pesticides safely
- ✓ Store pesticides safely
- ✓ Dispose of pesticides safely

When you apply any pesticide, you assume legal responsibility for using it strictly in accordance with label instructions. You must always protect people who live or work in the treated area so they are not exposed to harmful residues. Do not use any pesticides or application methods that might injure nontarget animals or plants or damage property. Pesticide use should not endanger the environment or cause contamination of groundwater, soils, air, or human and animal foods. In addition, you must use pesticides in ways that avoid excessive exposure to any part of your own body. This chapter gives a brief introduction to pesticide types, formulations, hazards, and safety precautions for products used in general household pest control. Summarized in this chapter, you will find precautions that must be observed when handling pesticide containers; guidelines for mixing pesticides; steps to apply pesticides properly; safe ways to store these materials, and information on pesticide disposal.

HANDLING PESTICIDES

Handle undiluted pesticides in their original containers carefully. Wear unlined rubber gloves and protective clothing, such as a waterproof apron, when measuring concentrates. Do not drop or throw containers or packages when handling. Check for contamination or leaks when handling containers or packages, and do not let any leakage come in contact with clothing or skin. If you discover a leak, transfer the material into a similar container if possible. If a similar container is not available, transfer the material into any good container, but make sure the container is properly marked for identification. When working around a leak, you may need to wear respiratory and eye protection. Check the label for precautions and required safety equipment. Never walk through a spilled pesticide. Never leave pesticide containers unattended or stored in unlocked areas. Always keep pesticides away from food and water and away from sources of heat and fire. Never allow paper containers to get wet.

Do not eat, drink, or smoke while handling pesticides and pesticide containers. Wash thoroughly when you finish

handling pesticide containers and before eating, drinking, smoking, or using the bathroom.

MIXING PESTICIDES

Mix pesticides thoroughly to ensure the correct amount of pesticide is thoroughly incorporated into a measured amount of water or other solvent. Techniques for mixing pesticides are the same for large and small volumes. Before beginning, read mixing directions on labels of all pesticides you will be using and decide on the proper order that chemicals should be added to the spray tank. If adjuvants are needed, these are usually added before pesticides unless label instructions give a different order.

General Rules

- Read the label.
- Determine the protective clothing required by checking the pesticide label.
- Before adding pesticide to the spray tank, check for leaks in the tank and hoses. Make sure equipment is clean and operating properly.
- Use only clean water in the spray tank. Be sure the pH of the water is within a range suitable for the pesticide(s) being used. Buffers or acidifiers may be required to adjust the pH.
- Measure pesticides carefully, accurately, and safely.
- When mixing more than one pesticide in the spray tank, add the materials in the following order:
 - wettable powders
 - flowables and dry flowables
 - water-soluble concentrates
 - emulsifiable concentrates

APPLYING PESTICIDES

Make sure the correct amount of active ingredient is applied to the area to be treated and that the pesticide is confined just to that area.

Safety Instructions

- Calibrate application equipment accurately.
- Use correct amount of active ingredient. Check pesticide label for rates of application.
- Measure area to be treated so that correct quantity of pesticide mixture can be prepared.
- Check application site for hazards that might affect safety of applications. Hazards include electrical outlets and exposed wiring, sources of ignition (flames or sparks), confined spaces, and improper ventilation. They also include irregular surfaces over which the applicator or equipment must travel.
- If applied outside, make sure weather conditions are suitable.
- Set up an application pattern that prevents your having to walk or drive through treated areas.
- Do not apply pesticides in or near air conditioning or heating vents or ducts.
- Keep people and animals away from area during applications and until treated area is safe to reenter.

STORING PESTICIDES

Store pesticides in their original, tightly closed containers. When possible, wipe or wash pesticide residue off the outside of containers before putting them in storage. Protect pesticides from extremes in temperature and from getting wet. A pesticide storage area **should be a separate building away from people**, living areas, food, animal feed, and animals. The area must be well ventilated, well lighted, dry, and secure with easily located doors and windows. Post signs near all primary entrances to warn others that the building CONTAINS PESTICIDES.

Some pesticides do not store well for long periods of time. Extended storage, especially in temperature extremes, may cause chemical changes resulting in some products losing their effectiveness or in others becoming more toxic. Moisture and air picked up during storage may alter composition of some pesticides, especially those stored in unsealed containers. Solvents and petroleum-based chemicals can degrade some types of containers after a period of time.

Most pesticide chemicals should not be stored longer than two years. Before pesticides exceed their shelf life, use them in an appropriate application, or transport them to an approved disposal site.

PESTICIDE DISPOSAL

Leftover pesticide mixtures are considered hazardous wastes unless they can legally be used to control pests in

another site. Therefore, when possible, mix up only the amount required for each job. Never dump excess pesticides indiscriminately. Such dumping is a potential source of environmental and groundwater contamination and is illegal. Persons convicted of dumping are subject to large fines and jail terms.

Rinse-water from cleaning of equipment is also a hazardous waste and should be treated accordingly.

Hazardous materials, such as leftover pesticide residues, must be transported to an approved CLASS 1 dump site, or they may be rendered nontoxic by means of a treatment such as with ultra-violet light and ozone.

Pesticide containers must be triple rinsed before they can be disposed of at a CLASS 2 site.

Check with the Mississippi Department of Agriculture, Bureau of Plant Industry for methods of disposing of hazardous pesticide wastes and empty pesticide containers.

PESTICIDE TYPES

The most common pesticides used in and around structures are insecticides and rodenticides. Table 4-1 compares the toxicity categories of various insecticides used in structures, illustrating that some of the materials are more acutely hazardous than others. Occasionally, fungicides or herbicides are used to control pests near buildings. Wood preservatives are a special class of pesticide used to protect structural and decorative wood (decks, landscape timbers, fence posts), utility poles, and marine pilings.

Table 4-1. Common materials used to control insects in structures.

Common Name	Product Name	Category
acephate	Orthene	III
boric acid	Perma-Dust (PT 240)	III
cypermethrin	Demon WP Demon EC	II II
cyfluthrin	Tempo	II
diazinon	Diazinon 4E Knox-Out Whitmire PT 260 Diazinon 3d	II II II II
hydromethylnon	Max-Force Bait	III
hydroprene	Gencor	IV
lambdacyhalothrin	Commodore	I
proptamphos	Catalyst	I

Pesticides used for general household pest control are available in several types of formulations (Table 4-2). The following table defines some of the common formulations and describes their advantages and disadvantages. Insecticides and rodenticides can be applied as baits (treat-

ed grains, meals, or other substances), liquid, granules, gases, or dusts. Some insecticidal dusts are used as tracking powders or desiccants. Fungicides and most herbicides are generally applied as liquid sprays, although some herbicides are available in a granular formulation.

Table 4-2. Formulation types and their uses.

Type	Uses	Comments
Wettable Powder (WP)	Insecticide, Fungicide, Herbicides	Require agitation during application. May leave visible residues on treated surfaces after drying. Does not penetrate well.
Dry Flowable (DF)	Insecticide, Fungicide, Herbicides	Require agitation during application. May leave visible residue on treated surfaces after application. Does not penetrate well.
Soluble Powder (SP)	Insecticide, Fungicide, Herbicide	May leave some residue, penetrates better than WP or DF.
Emulsifiable Concentrate (EC)	Insecticide, Fungicide, Herbicide	May damage plants. May cause spotting or staining on treated surface.
Flowable (F)	Insecticide, Fungicide, Herbicide Limited Availability	Require agitation during application. May leave residues and does not penetrate well.
Ready-To-Use (RTU)	Insecticide	Convenient to use, but high cost per unit of active ingredient. Usually does not cause stains.
Fumigant	Insecticide, Fungicide, Herbicide and sometimes Rodenticides	Must be used in tightly sealed areas and requires special equipment and monitoring equipment.
Dust (D)	Insecticide mostly	Good to use in dry enclosed "out-of-sight" areas. Will leave a visible residue on surface.
Granule (G)	Insecticide	Outside area use. Active ingredient is carried on clay or other particle.
Micro-Encapsulated	Insecticide	A slow release formulation, increases the residual activity of the material. Sometimes will clog strainers.
Bait (B)	Insecticide, Rodenticide, Avicide	A food attractant is added to the active ingredient which increases the effectiveness.
Impregnated PVC and Paint additives	Insecticide, Fungicide, Herbicide	Items include flea collars, pest strips, and special paints. May include factory treated fabrics or carpets.

Liquids

Pesticide liquids are mixtures of powdered or liquid active ingredients combined with liquid carriers such as water or oil. Pesticides may dissolve in the carrier to form a solution or may remain suspended in the liquid to form an emulsion or suspension. Suspensions and emulsions require some constant agitation to maintain a uniform spray mixture.

Liquid pesticides are applied as spot treatment, crack and crevice treatments, fogs or mists in confined areas, or as general sprays to large areas. The common ways to apply liquid sprays are with aerosol dispensers, hand-held compressed air sprayers, backpack sprayers, or larger, motorized spray units.

When liquid sprays are applied, a residue of active ingredient remains on the treated surfaces and helps to control pests over a period of time. The length of time depends on the type of pesticide used, the type of formulation, the concentration of active ingredient applied, the type of surface treated, and environmental influences such as temperature, humidity, or sunlight. Undiluted pesticides contain concentrated amounts of active ingredients that may cause serious injury if inhaled, splashed, blown into the eyes, or spilled on the skin or clothing. Some concentrated pesticides may be flammable.

Applying liquid sprays in certain areas may be extremely hazardous. For example, electric outlets, motors, or exposed wiring pose a potential threat of electrical shock to persons applying water-based pesticide sprays. Pilot lights and gas flames from heaters and appliances may ignite flammable petroleum-based pesticides. Sparks from electric motors and switches, and glowing heating elements may also ignite flammable materials. Pesticide vapors or fumes in confined areas may injure people if ventilation is inadequate.

Gases

Gases that kill pests are fumigants. Fumigants control certain stored-product insects, drywood termites and wood-destroying beetles, soil-infesting nematodes, soil pathogens, and some rodents. The process of applying fumigants, or fumigation, is much different from other forms of pesticide application and requires special training, certification, and equipment.

Dusts

Dust formulations are finely ground dry powders that contain toxic materials. These are sometimes used to control rodents and certain insects. Most dusts are applied to inaccessible places where pests hide. Dusts do not penetrate surfaces and usually break down slowly. Therefore, the active ingredient in dust formulations remains on the treated surface and is active against pests for a long period of time if the treated area stays dry. Because they do not pen-

etrate, dusts are more effective than liquids on absorptive surfaces such as concrete.

Dusts may be applied in cracks and crevices, under cabinets or appliances, and in other areas inaccessible to children and pets. This formulation leaves visible residues on treated surfaces, which often limits its use to areas such as warehouses, attics, crawl spaces, and wall voids. Dusts usually provide better coverage than sprays in inaccessible or hard-to-reach places. In wall voids, they can be dispersed with compressed air to reach all surfaces. During manufacture, dusts are sometimes given an electrical charge, or they are combined with an electrically charged powder to make them cling to surfaces better. Bulb applicators, shaker cans, aerosol cans, and compressed air dusters are used to apply these formulations.

When using dusts, do not let them drift into the airspace of rooms or work areas. Apply dusts according to the instructions on the pesticide label. Always wear approved respiratory protection to avoid inhaling dust particles.

Toxic Tracking Powder. Toxic tracking powder is a dust formulation that may be useful where rodents will not accept bait or where there is an abundance of natural food. Rodents pick up the toxic dust on their body surfaces as they walk through it and later ingest some during grooming. The toxic component of some tracking powders can also be absorbed through the animal's skin.

FOLLOW LABEL DIRECTIONS for using a toxic tracking powder, and carefully select locations where the powder is to be used. Do not put powder where it can be dispersed by air movement or tracked by pests onto food, eating utensils, or food-preparation surfaces. Never use toxic tracking powder on shelves, cupboards, or ceiling beams in food preparation or eating areas. Do not use toxic tracking powder in food-processing plants or food-storage warehouses; never apply it in or around homes except inside wall voids or other inaccessible areas. In locations where people or animals may accidentally contact the powder, confine its use to bait stations. The combination of toxic tracking powder and toxic bait can sometimes be very effective.

Toxic tracking powder loses some of its effectiveness in damp areas because moisture causes the powder to cake and not stick to the animal's body; it may also speed the breakdown of the toxic material. Toxic tracking powder formulations are fast-acting poisons; therefore, rodents die quickly. Rodents' dying in inaccessible wall voids or other out-of-the-way areas could create odors or attract flies.

Desiccants. Desiccants are dusts or sorptive powders used to control some insect pests found in buildings. The powder wears away or adsorbs the waxy coating that protects insects from losing water. Desiccants often last longer than other forms of insecticides; however, insects must move through the dust and pick up some of the material for it to be effective. To apply, place desiccants into wall voids, attics, and crawl spaces, and dust them into other areas

where insects hide. Some desiccants are highly repellent, which helps exclude insects from treated areas. Avoid breathing dusts during application by wearing respiratory protection.

Granules

Granular formulations are sometimes used to control ants, sowbugs, earwigs, snails and slugs, grubs, and occasionally other soil-inhabiting organisms. The active ingredient is formulated onto clay, vermiculite, ground corn cobs, or other suitable material that might act as a carrier. The percent active ingredient ranges from 0.5 percentage to 15 percent. Most formulations used in general pest control will be in the one-to-five percent range.

Baits

Baits may be used to control specific types of insects as well as snails, slugs and rodents. Some birds, if not an endangered species, may be controlled with bait. If faced with a bird-control problem, it would be good to check with the appropriate regulatory agencies about the use of baits for bird control.

Most baits are a combination of pesticide and food material. They may be in the form of powders, grains, granules, gels, or blocks. Rodent baits are usually placed in a bait station or secured in protected places (Figure 4-1). Baits used to control snails, slugs, earwigs, or some cockroach species are usually broadcast over the soil around the outside of a structure.



Figure 4-1. Poisoned baits are usually placed in bait stations to prevent children or nontarget animals from being exposed to the toxic material.

Table 4-3 is a guide to selecting bait types. Choose bait types and bait-station styles based on the following criteria: (1) type of pest, (2) history of bait use, and (3) conditions of the baiting location. For example, when baiting for ants, select bait that foraging workers will carry back to the nest to feed to the colony’s reproductive members and immatures. In this example, the toxic substance must be slow acting so those foraging workers are not killed before they reach the nest. Bait used to control flies, on the other hand, must be fast acting to stop continued annoyance and prevent further egg laying.

Table 4-3. How to select bait types.

Pest	Type of Active Ingredient	How to Apply	Where to Use
Ants	Slow acting so workers can carry bait back to feed others.	Use bait stations such as hollow straws or factory-prepared containers.	Locate near nests, along trails, inside electrical boxes, and around periphery of buildings.
Birds	Quick acting. A permit may be required.	Use in bait stations or feeding troughs.	Based on permit use, near feeding or roosting sites.
Cockroaches	Quick acting for immediate knock down; slow acting for continued control.	Use in factory-prepared containers or place gels at site of activity.	Place under appliances, sinks, cabinets, and other concealed areas where cockroaches are found.
Flies	Quick acting so flies will not reproduce.	Apply in feeding stations.	Apply around resting sites or other areas that attract flies.
Rats and Mice	Include single- and multi-feeding as well as acute toxicants. May be added to water.	Use in bait stations or as bait blocks. Stations must be tamper resistant and large enough to accommodate several individuals.	Locate near runways or nesting sites. Choose several locations.

Certain rodent baits contain an anticoagulant which interferes with the animal's normal blood-clotting process. It is important for rodents to feed on some anticoagulant bait over a period of several days so they will consume enough toxic material to be effective. If there is an interruption of feeding for longer than 48 hours, the animal will recover, and accumulated toxic effects will be lost. To prevent this from happening, refill bait stations regularly. Other anticoagulant baits are effective after a single feeding.

Toxic powders, poisoned grains, and granular formulations used indoors usually need to be confined to bait stations unless they are placed in an area that is inaccessible. Bait blocks can be used without a bait station, but place them where they can be secured and are out of the reach of children, pets, and nontarget animals. In damp areas, use rodent bait in the form of paraffin blocks that can withstand moisture; the wax keeps the bait fresh and helps prevent mold. Do not apply powdered or granular baits to shelves or floors in areas where they can be hazardous to children or pets or contaminate food and other items.

Insects may infest poisoned rodent bait if it is left in a bait station for a long time, so replace bait frequently. Remove uneaten bait, and thoroughly clean bait stations. Dispose of old or unused bait in an approved hazardous waste disposal area. Contact your local Extension Office for information on toxic material disposal.

When a toxic material is applied to grains and other materials to make poisoned bait, it must be colored with a dye. Coloring serves several useful purposes: (1) it helps avoid mistaken identification so that grains are not used for human or livestock feed; (2) it is a convenient way of identifying the toxicant because specific colors are generally used for certain types of poisons; (3) it makes bait unrecognizable or unattractive to some nontarget organisms; and (4) it helps ensure that the bait is uniformly treated with the toxicant.

Rodent Bait. For controlling rodents, place bait near nests and along frequently used paths. Rats usually do not go out of their way to find it, and mice confine their activities to small areas most of the time. To improve the chances of its being discovered, place bait in several areas rather than in just one location. Each of the bait locations for mice, for example, should be not more than 10 feet from another source of bait. When possible, put bait under cover of some object so the rodents feel secure while feeding. For Norway rats, place bait along the bases of walls and near ground burrows. It is also possible to place bait in burrows and put a rock or other heavy object over the burrow opening so children and nontarget animals cannot reach it.

Insect Bait. Put insect bait in areas of greatest activity or where it cannot be sprayed or dusted. For ants, locate the bait along trails, near nest entrances, around the foundation of the building, and under sinks and other out-of-the-way locations inside the building. Apply cockroach bait

under appliances, under sinks, behind furniture, and in hidden areas where these insects have been observed or are suspected to occur; place bait at wall intersections, as cockroaches tend to travel along edges. For cockroach species that occur outdoors, place baits around or in woodpiles and in water-meter boxes and other protected locations where these insects are usually found.

Bait Stations. Be sure bait stations are suitably designed for the kind of bait used and the baited pest. For rodents, use stations that comply with the rodenticide label. These should be large enough to accommodate several rats or mice at a time. Provide at least two 1-inch openings into the feeding station for mice and two 2 ½-inch openings for rats. Multiple small openings are an important feature for an insect bait station.

Use only tamper-resistant bait stations to prevent children, pets, or nontarget animals from gaining access to the bait. Tamper resistant refers to a design that blocks access to the bait either through the opening used for filling the station or through the openings that rodents use. Stations must be secured to a surface to prevent them from being tipped or the toxic bait shaken out. Be sure the word "POISON" is clearly printed on each bait station. Bait stations are considered to be service containers, so they must be labeled with the following information: (1) the name and address of person or firm responsible for the bait station; (2) the identity of the poison being used; and (3) the signal word from the pesticide label. If the bait is a grain or granule, use a bait station equipped with an internal baffle to keep rodents from scattering it (Figure 4-2).

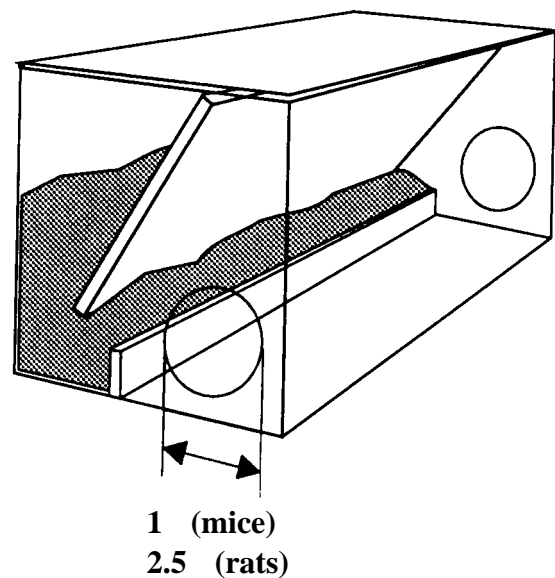


Figure 4-2. Bait stations must be equipped with an internal baffle, as illustrated, to prevent rodents from scattering the bait.

Bait shyness. If a baiting program is being used without success, the target pest may be developing bait shyness. Bait shyness develops if an individual animal dislikes the bait or has had a bad experience with it. Bait may be unattractive because it is old, moldy, or contaminated. If rodents are not feeding on the bait, check to be sure it is fresh and not contaminated; use another type of attractant and select a toxicant with a different mode of action to see if this improves acceptance. Be sure bait is located in areas where target pests have access to it. Sometimes prebaiting — setting out the same type of bait minus the toxicant — is helpful in overcoming bait shyness. Once the nontoxic bait is taken regularly, switch to the toxic bait.

HUMAN PESTICIDE INJURY

Poisons injure or kill people by interfering with the normal functioning of internal organs and systems. The nature and extent of injury depends on the toxicity of the chemical as well as the dose (amount of material) that enters the tissues of the body. The size, sex, and health of a person will influence the severity of injury.

The ingredients of some pesticides are very potent and are capable of causing poisoning at very low doses — a few milligrams or less. Other less potent pesticides might require that several pounds be consumed before signs of illness appear. Regardless of the potential hazard, anyone who works with pesticides should avoid exposure by using suitable protective clothing and application techniques. Anyone living or working in pesticide-treated areas must be protected from exposure levels that will cause injury.

Poisoning Symptoms

Symptoms are abnormal conditions, feelings, or signs that indicate the presence of an injury, disease, or disorder. When a person is exposed to a large enough dose of pesticide to cause acute injury or poisoning, some type of symptoms will usually appear immediately. For a listing of these effects, refer to the Appendix in the *Applying Pesticides Correctly Manual*.

The effect of an exposure can be localized, such as eye or skin irritation, or generalized, which happens when the pesticide is absorbed into the blood and distributed to other parts of the body. Other ways of measuring pesticide effects are (1) acute and (2) chronic or cumulative. If the person experiences immediate symptoms (usually within 24 hours) after coming into contact with a pesticide, the injury is termed acute. Acute effects are fairly predictable for a particular class of pesticides and are easier to diagnose than delayed effects. They can be reversed if properly treated. Effects might occur after repeated exposure to a pesticide over a period of time.

Examples of chronic illnesses associated with high or prolonged levels of exposure to certain pesticides include, among others, infertility, birth defects, and cancer. Some pesticide poisoning symptoms are similar to symptoms pro-

duced by many other chemicals. Symptoms may vary between chemical classes of pesticides and may be different among pesticides within the same chemical class. The presence and severity of symptoms usually are proportional to the amount of pesticide (dosage) entering the tissues of the exposed person. Symptoms may include a skin rash, headache, or irritation of the eyes, nose, or throat. These symptoms may go away within a short period of time and sometimes are difficult to distinguish from symptoms of an allergy, cold, or the flu. Other symptoms, which might be caused by higher levels of pesticide exposure, include any of the following: blurred vision, dizziness, heavy sweating, weakness, nausea, stomach pain, vomiting, diarrhea, extreme thirst, and blistered skin. Poisoning can also result in apprehension, restlessness, anxiety, unusual behavior, shaking, convulsions, or unconsciousness. Although these symptoms can indicate pesticide poisoning, they also may be signs of another physical disorder or disease. When the possibility of poisoning exists, consult a physician. Be sure to give the physician a copy of the pesticide label or the name of the pesticide, the manufacturer, and the EPA registration number. Diagnosis of a pesticide-caused injury usually requires careful medical examination, laboratory tests, observation, and familiarity with a person's medical history.

Individuals commonly vary in their sensitivity to pesticides. A person's age and body size may influence his or her response to a given dose; thus, infants and young children are normally affected by smaller doses than those affecting adults. An unborn child may be highly sensitive to exposure to some pesticides.

Pesticides that are applied in strict accordance to label directions (correct application rates, observing reentry intervals, using protective equipment, following aeration periods, etc.) do not leave unsafe levels of pesticide residues (Figure 4-3). Accidents during application may result in a higher, and sometimes unsafe, exposure. An improper application caused by failure to follow label instructions may also result in injury and legal liabilities.

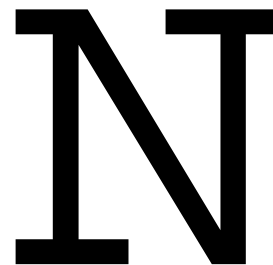


Figure 4-3. Follow the pesticide label and use instructions carefully. Observe any precautions listed.

HUMAN PROTECTION

Always apply pesticides in strict accordance with label instructions. Provide occupants with information about the pesticide application, and be sure they understand the safety precautions that must be taken. Include the following information:

- The name of the material being used.
- Poisoning symptom; procedures to follow if problems occur; where to get help; and how to get more information.
- Areas of the building being treated.
- What to expect, such as an odor or residue.
- The possibility of finding dead insects or rodents and what to do if this happens.

Also explain ways to reduce personal exposure, such as removing or covering food and utensils before pesticide applications; protecting linens and bedding and similar items; opening windows and doors to increase ventilation; vacuuming carpets and cleaning floors after an application, and keeping children and pets away from treated areas.

Pesticides may be needed to control pests in places where food is stored, prepared, or eaten. If so, take special precautions. For instance, never treat food-preparation surfaces with dusts or liquid sprays, and do not allow residues to drift onto food or utensils. If fogs are used, thoroughly clean all food-preparation surfaces after application.

Never make an application near air ducts or ventilation systems unless the system can be shut down for a period of time. Do not apply pesticides inside heating or cooling ducts.

Infants, Children, the Elderly, and People with Medical Conditions

Sometimes the use of pesticides in buildings must be restricted or avoided to protect people living there. Rely on nonchemical control methods as much as possible and use a pesticide only where necessary. When pesticides are needed, choose the safest formulation available, such as bait or low-volatility liquid spray. Follow label instructions and precautions carefully. Be extremely careful when using pesticides in areas occupied by infants, children, the elderly, or someone who is sick. These areas include hospitals, nursing homes, schools, and certain households.

Infants are more vulnerable to pesticide exposure than larger children or adults. This is because of their small size and undeveloped physiological systems responsible for detoxifying chemicals. Do not apply pesticide to anything used for infant care, and avoid spraying or dusting carpets, clothing, blankets, towels, or any fabrics that infants or others may contact. When a pesticide is needed in areas where an infant may spend part of the day, use a formulation that will break down completely before the infant returns.

Children under the age of six are active and curious. It is difficult to keep them away from places where a pesticide has been used for household pest control. Young children explore a lot and put many objects (including their hands) into their mouths. They also crawl on floors and climb on other surfaces. Therefore, never apply a pesticide to play equipment, toys, or any surface youngsters normally touch. On carpets, use pesticides that break down rapidly. In all cases, use pesticides having low toxicity and low volatility. If you use bait stations or traps, secure them well out of reach and sight.

Elderly people may be susceptible to respiratory illnesses and other disorders that may give them a low tolerance to many airborne dusts and chemicals, including specific pesticides. In some instances, their bodies may not be able to properly degrade or eliminate foreign or toxic materials. Therefore, use extreme caution when making pesticide applications in rooms where elderly people sleep or spend long periods-of-time. If possible, avoid treating these places. In other areas, use a low toxicity and low volatility pesticide. Apply as a spot treatment only as necessary. Select alternate methods of control when possible, and always augment pesticide use with other pest-control techniques so that the amount of pesticide used can be reduced.

People who are acutely ill or who suffer from conditions such as diabetes or alcoholism, or those who have allergies or respiratory disorders including asthma and emphysema, may be more sensitive to pesticides. Medications used to treat illnesses may influence the effects of pesticide exposure. Provide persons who are ill or using medications with the name of the pesticide you plan to use, and ask them to contact their physicians for advice.

Applicator Safety

Safety risks for applicators working in buildings or enclosed areas are compounded by hazards such as electrical equipment, possibility of explosions, and confined work areas. Learn to recognize hazards in the application site that could cause injury, and know the symptoms of poisoning. Avoid pesticide exposure by wearing required or recommended protective equipment. Refer to the section on “Personal Protective Equipment” in the *Applying Pesticides Correctly Manual*. Examples are given of suitable protective equipment based on label recommendations. Carefully maintain, clean, and store protective equipment to keep it in good condition and to ensure that it provides optimum protection.

Power tools and other electrical equipment can create hazards. Wiring in older buildings may not accommodate heavy-duty electrical equipment. Before connecting equipment, use a circuit tester to make sure the outlet is correctly grounded. Check the wiring size and the fuse or breaker box to be sure that the system can handle the electrical demand of the equipment being used. If the circuit is not protected with the correct size fuse or circuit breaker, or if

wiring is too small, an overload could heat the wiring and start a fire. Inadequate grounding can cause a fatal electric shock; prevent this hazard by using a ground fault interrupter (GFI).

Working in Confined Areas

Confined areas present special hazards to pesticide applicators. Confined areas may be attics, crawl spaces beneath buildings, storage areas, closets, small rooms, and other places that have poor ventilation. Hazards include inhaling the pesticide being applied and being exposed to treated surfaces. Cramped areas may be uncomfortably hot because of poor air circulation. High temperatures may increase your exposure potential, because sweating and high temperatures accelerate the rate of skin absorption of some pesticides.

Reduce exposure hazards when working in confined areas by wearing personal safety equipment. When possible, increase ventilation in the treatment area by opening windows or using a fan to bring in fresh air. Always begin the application from a point furthest from the exit. Never walk or crawl through freshly applied pesticide.

To avoid breathing fumes, wear an approved pesticide respirator. Be sure it seals well around your face and is in good working condition. A cartridge or canister type respirator must be worn whenever a CATEGORY I or CATEGORY II pesticide is being used in confined areas. Applicators with beards or long sideburns must use a powered cartridge respirator, because facial hair prevents adequate sealing of conventional respirator face masks. When atmosphere-monitoring equipment indicates that an oxygen deficiency condition exists or when applying a fumigant, a supplied-air respirator is required.

Prevent skin or eye contact with spray residue or vapor. Always wear a long-sleeved shirt and full-length pants, coveralls, or lightweight spray suit when making an application. Protect your hands with waterproof gloves and use a face shield or goggles to prevent spray or dust from getting into your eyes. Check the pesticide label for the minimum protective clothing requirements.

PROTECTING PETS AND DOMESTIC ANIMALS

Pets housed in or near residences or other buildings include several types of mammals, birds, reptiles, amphibians, and fish. Associated with pets and domestic animals are their foods and water supplies, bedding, pens, equipment and toys.

Most animals are susceptible to injury by pesticides, even some types that are applied at low doses. Fish and birds are among the most susceptible. Cats are very sensitive because they are metabolically unable to detoxify many types of pesticides. Young animals and old or sick animals may be affected by lower pesticide doses than adult or healthy animals. Cats and dogs lie and sleep on the ground

and other surfaces that may have been treated. They groom and clean themselves by licking, which increases their potential for exposure even when small amounts of pesticide have been used.

To provide protection for pets and domestic animals, remove them from the area before applying a pesticide. Keep animals away until the spray dries and the area is well ventilated. Do not apply pesticides on or near animal food or water. If the animals return to the treated area, remove their flea collars. Discontinue any ectoparasite systemic medications. Pets or domestic animals can be the source of some pest problems. For instance, dogs and cats usually bring fleas inside; dogs may also bring in ticks. Animal manure provides food and breeding sites for several fly species. Pet or livestock food or food left in an animal dish or feeder can attract mice and rats as well as cockroaches, flies, and ants. An animal's water dish may provide the water some pests need. Therefore, when performing pest management in an area where pets or livestock are kept, look for these types of conditions. Evaluate and, if necessary, suggest modifications of the feeding routine, housing arrangement, and sanitation practices to reduce pests.

PESTICIDE DRIFT

If pesticides are not carefully applied, they may drift beyond the treatment site and become deposited as unacceptable residues on surfaces not intended to be treated. These residues can possibly endanger nontarget organisms. Residues from improper application or rinsing of equipment may also contaminate surface or groundwater.

Preventing Drift or Unwanted Exposure

Do not use dusts in outdoor locations. To prevent drift when applying liquid sprays, use low pressures and large-nozzle orifices. This prevents the formation of small droplets subject to drift. Never make an outdoor application of a liquid spray when the wind is blowing faster than 5 miles per hour. If there is a slight wind, select a formulation or adjuvant that reduces drift. Be especially careful if you are spraying near fruit trees or vegetable gardens, flowers, laundry being air dried, cars, windows, dark surfaces that may spot, pet or livestock food and water containers, fish ponds, bird baths, swimming pools, saunas, spas, or outdoor furniture. Avoid outdoor applications that may drift to children's play areas, sandboxes, swing sets, or lawns and shrubbery that children contact.

Do not apply a pesticide outdoors where residues can be carried into a well, stream, pond, or other water source. Never drain or wash application equipment where runoff can occur into sewers, sinks, sumps, or drainage tiles. When applying liquid or dust inside, keep it away from air ducts, fans, or blowers to prevent the material from being blown around.

CHARACTERISTICS OF TREATED SURFACES

You may need to evaluate the surface of a treatment site before applying a pesticide. Depending on the type of surface, a pesticide can be absorbed and rendered ineffective, or the surface may be stained or etched. Concrete, for example, is porous and tends to absorb liquid sprays, reducing the amount of residue on the surface available to control target pests.

Floor coverings such as linoleum, tile, and carpeting can be stained or etched by some pesticides or solvents. Certain wallpapers and carpets contain dyes that may run, dissolve, or change colors if exposed to some pesticide components. Paint and other finishes used on walls or woodwork may also react with these chemicals to produce spotting or discoloration. Fabrics of all types, and the dyes used for patterns and color, may also react, affecting wear or causing a stain or color change. A soiled fabric may react differently than a clean one. Fabrics also can absorb a liquid pesticide, reducing effectiveness. Dust formulations leave an unsightly residue if applied to surfaces of furniture, woodwork, fabrics, and other items in the treatment area.

Preventing Problems

Stains or color changes may be caused by too strong a dose or by application techniques. The formulation type may affect staining or spotting. A soiled or greasy surface may increase staining, spotting, or absorption. Paint that has been recently applied and not fully cured has a tendency to spot.

When possible, apply a pesticide to an inconspicuous area, such as a closet, and allow the pesticide to dry for several hours to observe the reaction. Be careful when treating upholstery, furniture, drapes, or lower wall surfaces with a pesticide. Lower wall surfaces are more likely to be soiled, which may enhance staining or bind the pesticide to make it less effective. Follow label directions and precautions carefully to avoid staining, spotting, visible residues, and pesticide deactivation. Thoroughly clean the application equipment before adding a pesticide to prevent a possible reaction between the pesticide and contaminants in the equipment. These contaminants may cause stains or other adverse effects.

When two or more pesticides are mixed, additional problems associated with pesticide compatibility may appear. Check the compatibility of pesticide mixtures before application.

Odor Problems

Many pesticides have odors that can be detected during and after application. An odor may be a chemical characteristic of the pesticide or its solvent, or it may be a substance added to the pesticide as a warning agent to reduce chances of injury. To reduce odor problems, follow these precautions:

- Use only the application rate stated on the pesticide label.
- Apply the pesticide in localized areas or as a spot treatment if possible.
- Use a low-odor formulation if available and if appropriate.
- Increase ventilation to the application area by opening windows and doors or by using fans.
- Apply pesticide when the building is not occupied.

An odor also may be caused from a reaction between the pesticide and surfaces that have been treated. Before applying any pesticide in a confined area, read the pesticide label to determine if any of the chemicals in the formulation will react with treated surfaces to produce an odor.

TRANSPORTING PESTICIDES

Pesticides must be transported with special care to prevent spills or accidents that might injure people and animals or damage the environment. A pesticide spill on a roadway can result in serious problems.

Pest-control service vehicles such as pickup trucks or vans are generally used to carry pesticides and application equipment to work sites. Some pesticides may be in original containers or service containers; others may be in a spray tank or application device. Based on toxicity and volume, some pesticides transported on public roads are classified by regulatory agencies as hazardous materials. Classification as a hazardous waste greatly complicates the manner in which pesticide materials can be transported, stored, and disposed of.

Government agencies regulate hazardous material and hazardous waste transportation on public roads. Under certain conditions, a permit may be required to transport hazardous materials or wastes. Transportation regulations also require that certain vehicles be equipped with placards indicating the class of hazardous material carried. Vehicles may be subject to inspection by the Mississippi Highway Patrol (MHP). See Table 4-4 for important factors to consider when transporting pesticides in a vehicle. Consult with MHP and the Mississippi Department of Transportation for information on regulations and permits.

Table 4-4. Factors to consider when transporting pesticides.

Containers	Use original container. Be sure container is sealed. Use appropriate service container, tightly sealed. Use application tank or equipment with proper seal.
Label	All containers and application equipment must be labeled to show contents of container, signal word, responsible party, and the statement “Keep out of reach of children.”
Vehicle	Transport pesticides in a truck where cargo is separate from passenger area. Do not carry people or animals in cargo area. Do not carry food or animal feed in cargo area. Secure containers and equipment containing pesticides. Do not stack pesticide containers higher than the sides of vehicle’s cargo area.
Placards	Placards may be required on vehicle. Check with the Mississippi Highway Patrol or Department of Transportation. If required, placards must be placed on all four sides of vehicle and be clearly visible.
Securing	If vehicle is left unattended, secure pesticides in a lockable container. Covers on tanks containing pesticides must be locked, or equipment must be in a locked part of the vehicle.
Accidents	Accidents involving pesticide spill on public roads must be reported to local police and fire authorities or the Mississippi Highway Patrol immediately. Call “911.” Never leave the accident site until another responsible party arrives and supervises the clean-up. Keep people away from the spill.
Records	Keep records of all pesticides carried in the vehicle. Have copies of the Material Safety Data Sheets for each pesticide in the vehicle. This information is useful to emergency workers.
Protective Clothing and Equipment	Do not wear or store contaminated clothing or equipment in the passenger compartment. Store clean clothing and equipment in a separate compartment from contaminated clothing and equipment.

During transport, keep pesticides in their original containers or in approved, labeled service containers. If a container has previously been opened, be sure it is tightly resealed before transporting. Carry pesticides in approved containers and label them according to state regulations. Service containers must be labeled with the name of the pesticide, the EPA registration number, and the concentration of the pesticide. It should also bear the statement “KEEP OUT OF THE REACH OF CHILDREN.” State regulations do not specify a container type or design; however, common sense would dictate that the container not resemble a food or beverage container.

During transport, secure all pesticide containers and application equipment to avoid spills or container damage.

Use sand bags, blocks, ropes, or straps to prevent movement. The vehicle should be equipped with an emergency spill control kit, including a supply of absorbent material, a special container for holding waste, and a quantity of clean water. If a spill occurs, no matter how small, clean it up immediately.

Lock the area within the vehicle where pesticides are carried to keep children or unauthorized adults out when the vehicle is unattended. Also, lock tanks containing diluted pesticides, or store tanks and other equipment containing pesticides in a locked area on the vehicle that is separate from food, feed, and passengers.

