

Part 7: Safe Handling of Pesticides

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Key Questions About Safe Handling of Pesticides

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- When should you wear a respirator?
- How should protective clothing be washed?
- Why is it extra important to follow safety precautions when mixing and loading pesticides?
- What would be a “good” storage area for pesticides?
- How should you dispose of empty pesticide containers and leftover spray mixtures?
- Do you know what to do if there is a pesticide spill?

Protective Clothing

Adapted from HE-FO-3877 1990—Buying and Wearing Protective Clothing for Applying Pesticides. Wanda Olson, Sherri Gahring, and Dean Herzfeld. Minnesota Extension Service.

Personal Protective Equipment (PPE)

Wearing protective clothing when applying pesticides can reduce the risk of pesticide poisoning because it reduces the chance of exposure. Many pesticide labels instruct the user to wear personal protective equipment (PPE). PPE is clothing and devices that protect the body from contact with pesticides or pesticide residues. Pesticides covered by the newly revised Worker Protection Standards must now list PPE requirements more clearly on their labels. If specific clothing, such as goggles or a full protective suit, is not listed on the label, use the signal words, precautionary statements, and the product formulation as guidelines.

Precautionary statements such as “Harmful or fatal if inhaled” tell you that you need more protection than normal and that a respirator should be worn. It is also important to consider product formulation when choosing the type of clothing to wear. For example, emulsifiable concentrates (oil-based liquids) are generally easily absorbed through the skin, while products that are dusts, wettable powders, and granules are easily inhaled.

You can find out more about PPE for pesticides, and many other chemicals, from the Material Safety Data Sheets (MSDS). The MSDSs, which are available from pesticide manufacturers, have sections on health hazards and the need for special protection.

Protection Offered by Clothing

The type of clothing you buy and how you wear it will determine your level of protection from pesticide exposure as well as your comfort. You will have some protection by just wearing regular work clothing. However, specialized liquid-proof, chemical-resistant clothing will provide much greater protection. When the situation requires the greatest protection, combining safety with comfort is more difficult. A summary of clothing guidelines includes:

- Always wear work clothing with long pants and sleeves.
- Wear unlined, liquid-proof, chemical-resistant gloves; unlined neoprene or rubber boots; and a wide-brimmed hat.
- At the very least, in addition to the above, wear a chemical-resistant apron over cloth coveralls when mixing, loading, or handling undiluted pesticides.
- Wear liquid-proof, chemical-resistant coveralls or suit with a hood or wide-brimmed hat if there is any chance of becoming wet with spray.
- Wear a respirator whenever there is a risk of inhaling pesticide vapors, fumes, or dust.
- Wear eye or face shields whenever there is a risk of pesticide coming in contact with the eyes.

Types of Protective Clothing

Regular work clothes

The protection offered by regular work clothing depends upon the fabric, the layering of clothing, and the use of soil-repellent finishes. Cover as much of your body as possible with the work clothes. Wear long pants and sleeves. Button or fasten shirts at the neck and wrists. Do not go barefoot.

Heavyweight and tightly woven fabrics of cotton or polyester/cotton blends (instead of 100 percent synthetic fabrics of equal weight) provide greater protection. However, studies have shown that polypropylene knit's wicking properties make it more effective than cotton knit as an underlayer in preventing pesticide penetration. Layering clothing also helps prevent pesticides from reaching the skin.

Soil-repellent finishes increase the protection offered by regular work clothing, making it similar to uncoated Tyvek®. Fluorochemical finishes such as Scotchgard® or Zepel® repel water as well as oil. Renewable finishes must be applied after every second or third wash.

Gloves

Hands should always be protected whenever handling undiluted or diluted pesticides; unopened or empty pesticide containers; or contaminated equipment, clothing, and other materials. Unlined, clean gloves at least 12 inches long with sealed seams are necessary when handling undiluted or highly toxic pesticides. Nitrile, neoprene, and butyl rubber are good choices. Do not wear cotton or leather gloves because neither can be properly cleaned.

Sleeves should be worn outside the glove to prevent pesticides from

running down inside the glove. When working with arms raised, wear gloves over the sleeves that have a cuff to catch drips. Duct tape or elastic bands can be used to seal the gloves at the sleeve and are especially useful in activities when arms are both raised and lowered. Wash the outside of the gloves before taking them off to avoid pesticides getting on hands; then wash the inside of the gloves.

Aprons, rainsuits, and other specialized protective clothing

Chemical-resistant clothing should be worn during mixing, loading, or other handling of undiluted pesticides. This can be a butyl rubber, neoprene, or Tyvek® apron over a work coverall, a PVC rainsuit, or one of the newer chemical-resistant coveralls, depending upon the label requirements. Aprons with sleeves—but with the back open—may be a good choice if heat stress is a concern and shoulder and arm protection is needed. The protection offered by chemical-resistant clothing depends upon the fabric and design features such as flaps over zippers, elastic at the wrist and ankle, and bound or sealed seams.

Footwear

Feet and shoes also need protection from pesticide spills. Pant legs should go over the boot. Unlined neoprene or butyl rubber boots, or Tyvek® shoe- or bootcovers should be worn. It is also important to wear clean socks daily. Leather and canvas shoes cannot be cleaned properly and should never be worn without rubber or neoprene boots. Always clean the outside of the boot before removing it.

Eye protection

Wear goggles, or a face shield, to protect the eyes from splashes and dust particles. Face shields can be purchased to fit on a hard hat. Goggles can be worn with a negative-pressure respirator or a dust mask. For best protection, goggles should have a snug fit around the nose and temple area.

Head and neck protection

A chemical-resistant hood or wide-brimmed hat will help keep pesticides off neck, eyes, mouth, and face. With airblast spraying, covering the head and neck is especially critical. Many PVC or Tyvek® coveralls and rain coats/suits have hoods attached. Hard hats should not have cloth or leather sweatbands. Company or baseball hats made with fabric mesh or designed with open areas do not protect the wearer from exposure.

Chemical Resistant PPE

Some labels require the use of chemical-resistant PPE—personal protective equipment that the pesticide cannot pass through during the time it takes to complete the task. The labels of a few pesticides, such as some fumigants, prohibit the use of chemical-resistant PPE. Most chemical-resistant PPE items are plastic or rubber. However, not all these materials are equally resistant to all pesticides under all conditions.

Chemical resistance factors

Three factors affect a material's chemical resistance: the exposure time, the exposure situation, and the chemical properties of the pesticide product to which the material is exposed.

Exposure time. Not all types of materials that are resistant to a particular pesticide will provide protection for the same amount of time. Some will keep the pesticide out for a long time. Others will allow the pesticide to reach the skin fairly quickly. Disposable plastic gloves, shoe covers, or aprons may provide enough protection for tasks that can be done in a few minutes. Longer jobs usually require items made of a more resistant material.

A pesticide begins to move into a material as soon as it gets on the surface. The pesticide continues to move into and through the material until the pesticide is removed. You can help prevent pesticides from getting through chemical-resistant items, such as gloves, boots, and aprons, by regularly rinsing off pesticides that are splashed or spilled on them. Chemical resistance is often stated in terms of exposure time (the time from first exposure until the chemical breaks through to the other side of the material). For example, neoprene may be resistant to one solvent for 30 minutes or less and to another solvent for more than 4 hours.

Exposure situation. A chemical-resistant material will not continue to be protective if it is damaged. For tasks that involve handling sharp objects or walking through rough terrain, a sturdy material would be necessary to resist punctures or tears.

Type of chemical. No single material can protect against all pesticide products. The chemical resistance of a material depends on whether the pesticide is liquid or dry, and what dilutents or solvents are used.

Chemical resistance of PPE materials

Look for PPE items whose labels state that the materials have been tested using ASTM (American Society for Testing Materials) test methods for chemical resistance, such as test method F739-91. Gloves and footwear made of polyvinyl chloride (PVC) or rubber (butyl, nitrile, neoprene, or natural rubber) must be at least 14 mils thick. Pesticides can leak through stitching holes and gaps in seams. For chemical resistance, PPE should have sealed seams.

Tyvek® is a non-woven olefin fabric that should be worn over regular work clothing. Although fairly strong, it can be punctured when worn around machinery. It is flammable and should not be used near heat, flame, or sparks. Tyvek® is intended to be disposable; its protection after washing has not been tested. If you do re-use a “disposable” garment that isn’t torn or heavily soiled, hang it in a well-ventilated place between uses.

Tyvek® comes uncoated or as a laminate (polyethylene [PE]-coated or Saranex-23P®). The effectiveness of uncoated Tyvek® is similar to soil-repellent finished cotton or cotton/ polyester blends. It is suitable for handling granular or powdered formulations and diluted and less toxic pesticides. The laminates of Tyvek®, especially Saranex-23®, are suitable for handling undiluted and highly toxic pesticides.

The PE Tyvek® is not suitable for extended exposure to the liquid organophosphates because the solvents damage PE coating. Organophosphates include malathion, terbufos, diazinon, fonofos, and diamethoate. Neither PE Tyvek® nor Saranex-23P® are suitable for use with chlorinated hydrocarbons such as methoxychlor.

Goretex®, a microporous laminate commonly found in outdoor sportswear,

offers good protection and is comfortable in hot weather, but is expensive.

Barrier-laminate materials are resistant to most pesticides and are a good choice for many situations. Barrier-laminate (Silver shield/4-H) gloves may be uncomfortable and clumsy to wear for some kinds of tasks. Try wearing fitted rubber gloves over barrier-laminate gloves for comfort, protection, and dexterity.

Any plastic or rubber material is resistant to dry pesticides and to water-based pesticides (those that use water as the only diluent or solvent). Dry pesticides include dusts, granules, pellets, and some baits. Water-based pesticides include wettable powders, soluble powders, some solutions, dry flowables (water-dispersible granules), and microencapsulated pesticides.

Whether a material is resistant to non-water-based liquid pesticides depends on the formulation. Some examples of liquid pesticides that are not water-based are emulsifiable concentrates, ultra-low-volume and low-volume concentrates, low-concentrate solutions, flowables, aerosols, dormant oils, and invert emulsions. Common solvents are xylene, fuel oil, petroleum distillates, and alcohol.

Choosing chemical-resistant PPE

Materials not listed on label

If the pesticide label requires the use of chemical-resistant PPE but does not state which materials are resistant to the product, select sturdy barrier-laminate, butyl, or nitrile materials. Then watch for signs that the material is not chemical-resistant. For example, the material may change color; become soft or spongy; swell or bubble; dissolve or become jellylike; crack or get holes; become stiff or brittle. If any of these changes occur, discard the item and choose another type of material.

Specific PPE materials listed directly on label

If the pesticide label specifies the PPE materials that must be worn when using the product, follow those instructions. Some labels may list examples of PPE materials that are highly chemical-resistant to the product. The label may say, for example: "Wear chemical-resistant gloves, such as barrier-laminate, butyl, nitrile, or viton." You may choose PPE items made from any of the listed materials.

Chemical-resistance category listed on label

Pesticide labels that list examples of PPE materials will often also specify a chemical-resistance category (A through H) for the product. This allows you to consult an EPA chemical-resistance chart (such as Table 1) to learn whether you have the option of using PPE materials other than those listed in the examples on the label.

Using the chemical resistance category selection chart

If the pesticide label lists a chemical-resistance category, check an EPA chemical-resistance category selection chart (page 7-7) to find out all the PPE materials in that category from which you can choose. The chart indicates how long you can expect each type of PPE material to be resistant to the type of pesticide you are using. If you do not replace or clean the PPE items within the time intervals specified on the chart, it is considered a misuse of the pesticide. After the time interval is up the items no longer meet the label's requirements for "chemical-resistant" PPE.

When choosing an appropriate material, also consider the amount of movement and handiness needed for the task and whether the material will withstand the physical demands of the task. The PPE will protect you for the approximate time listed on the chart, if:

- No punctures, tears, or abrasions allow pesticide to penetrate the material; and
- Pesticide does not get inside the PPE through careless practices, such as allowing pesticide to run into gloves or footwear or putting the PPE on over already contaminated hands or feet.

Highly Resistant PPE. A rating of high means that the material is highly resistant to pesticides in that category. PPE made of this type of material can be expected to protect you for an 8-hour work period. The outside of the PPE, especially gloves, should be washed at rest breaks—about once every 4 hours. Highly resistant PPE is a good choice when handling pesticides, especially concentrates, for long periods of time.

Moderately Resistant PPE. A rating of moderate means that the material is moderately resistant to pesticides in that category. PPE made of this type of material can be expected to protect you for 1 or 2 hours. After that, replace the PPE with clean chemical-resistant PPE or thoroughly wash the outside of the PPE with soap and water. Moderately resistant PPE may be a good

EPA Chemical Resistance Category Selection Chart For use when PPE section on pesticide label lists a chemical resistance cat.								
Selection Category Listed on the Pesticide Label	Type of Personal Protective Material							
	Barrier Laminat	Butyl Rubber > or = 14 mil	Nitrile Rubber > or = 14 mil	Neoprene Rubber > or = 14 mil	Natural Rubbe > or = 14 mil	Polyethy > or = 14 mil	Polyinyl Chloride (PVC)	Viton > or = 14 mil
A (dry and water-based formulat	High	High	High	High	High	High	High	High
B	High	High	Slight	Slight	None	Slight	Slight	Slight
C	High	High	High	High	Moderat	Moderate	High	High
D	High	High	Moderate	Moderate	None	None	None	Slight
E	High	Slight	High	High	Slight	None	Moderate	High
F	High	High	High	Moderate	Slight	None	Slight	High
G	High	Slight	Slight	Slight	None	None	None	High
H	High	Slight	Slight	Slight	None	None	None	High

* includes natural rubber blends and laminates
 High: Highly chemical-resistant. Clean or replace PPE at end of each day's work period. Rinse off pesticides at rest breaks.
 Moderate: Moderately chemical-resistant. Clean or replace PPE within an hour two of contact.
 Slight: Slightly chemical-resistant. clean or replace PPE within 10 minutes of contact.
 None: No chemical-resistance. Do not wear this type of material as PPE when contact is possible.

choice for pesticide handling tasks that last only a couple of hours.

Slightly Resistant PPE. A rating of slight means that the material is only slightly resistant to pesticides in that category. PPE made of this type of material can be expected to protect you for only a few minutes after exposure to the pesticide product. After that, replace the PPE or thoroughly wash the outside of the PPE with soap and water. Slightly resistant PPE may be a good choice for pesticide handling tasks that last only a few minutes.

Inexpensive disposable gloves or shoe covers, such as those made from polyethylene, may be useful for such brief tasks as:

- Adjusting contaminated parts of equipment;
- Unclogging or adjusting nozzles;
- Opening pesticide containers;
- Moving open pesticide containers or containers with pesticides on the outside;
- Handling heavily contaminated PPE;
- Climbing in and out of cabs or cockpits where the outside of the equipment is contaminated; and
- Operating closed systems.

These disposable PPE items should be used only once, for a very short-term task, and then discarded. At the end of the task, it is a good idea to first wash the outside of the gloves or shoe covers, and then remove them by turning them inside out. Discard them so they cannot be reused.

Handling Contaminated Clothing

Adapted from HE-FS-2312 1993 Washing Clothing Worn While Applying Pesticides. Wanda Olson and Cheryl Nelson. Minnesota Extension Service.

Clothing worn while applying liquid, granular, or powdered pesticides may be soiled with pesticide residues even if you cannot see or smell the pesticide. Research has shown that pesticides can be transferred from the outer layer of clothing to inner layers of clothing. If the inner layer is close to the skin there is increased risk of exposure to the wearer. Many of the most toxic pesticides are granular. These transfer to clothing (and sweat and body oils increase the transfer).

Clothing worn while applying pesticides should be washed every day. However, clothing soiled with highly toxic and concentrated pesticides must be handled carefully. Since liquid, oil-based concentrates are very difficult to remove from fabrics, clothing soiled with highly toxic liquid pesticides should be discarded. In general, the more water-soluble the pesticide, the easier it is to remove.

Wash pesticide-contaminated items separately from uncontaminated clothing and laundry. Otherwise, the pesticide residues can be transferred onto the other clothing or laundry and can harm you or your family. Wear rubber gloves when you handle clothing with pesticides on it. Keep the clothing separate from other clothing until it has been washed.

Pesticides can cling to and be absorbed by the protective clothing that you

wear. Therefore, it is important to use special care when you handle the clothing.

In order to handle and wash clothing as safely as possible, you should know when the clothing was contaminated, which pesticides have been used, and the pesticide formulations used.

Laundering Contaminated Clothing

Most pesticides can be removed from clothing if you follow the washing instructions below. If undiluted emulsifiable concentrates have spilled on any clothing, discard the clothing (except for rubber or neoprene gloves and unlined boots). Washing will not remove enough pesticide to make the clothing safe to wear. In research tests, clothing with undiluted emulsifiable concentrate on it still contained a high amount of pesticide even after ten washings. If the emulsifiable concentrate pesticide was diluted, three washings removed nearly all of the pesticide.

Use repeated washings with hard-to-remove pesticides especially when they are highly toxic. Following are guidelines for handling and washing clothing with pesticide residues.

- Wear waterproof gloves when handling clothing with pesticides on it.
- Wash gloves, boots, aprons, suits, goggles and respirators with detergent and water. Hang or store away from other clothing. When handling pesticides, rinse gloves before removing them from your hands.
- Empty pesticide granules from cuffs and pockets before washing.
- Wash machine washable items separately from family laundry.
- Wash only a few items at a time. Use the highest water level and longest wash time available on your machine.
- Prerinse or presoak the clothing.
- Wash items soiled with hard-to-remove pesticides two or three times. This is especially important when clothing is soiled with highly toxic pesticides.
- Do small loads with a high water level. Run a second cycle with washers which use less water, such as a front-loading washer.
- Use hot water for washing (146°F).
- Use heavy duty detergents and liquid detergents for oil-based pesticides. Use 1½ times the recommended amount of detergent for heavily soiled clothes or when a soil repellent finish has been applied. A prewash laundry product is effective in removing oil-based pesticides.
- Clean the washing machine by running a complete cycle with detergent.
- Line dry clothing. Sunlight helps break down some pesticides.

Laundry aids

The use of chlorine bleach in a regular wash cycle is not effective in removing pesticide residue from fabric. However, a three-hour soak in a

chlorine solution (1 cup chlorine bleach to 16 gallons of water) effectively removes chlorpyrifos (Lorsban, Dursban) residue from cotton work clothing.

Soil repellent finishes and starch finishes increase protection of regular work clothing. The renewable repellent finishes such as Scotchgard® and Zepel® repel water as well as oil. Apply the finish after every washing, especially on 10 or 12 oz. heavyweight denim. With soil-repellent finishes, use a prewash product such as Spray and Wash™ or Shout™ and 1½ times the recommended amount of detergent.

A stiff fabric starch finish traps the pesticide, which is washed away with the starch. Apply starch each time the garment is washed using either spray or liquid products. When applying pesticides at ground level, apply starch to pant legs from the knees down.

Percent of pesticide residue on fabric after laundering (under laboratory conditions)

Insecticides	% of Residue	Herbicides	% of Residue
Carbamate		Acetanilide	
carbaryl FL (<i>Sevin</i>)	10	alachlor EC (<i>Lasso</i>)	2
carbaryl WP (<i>Sevin</i>)	0		
Organophosphate		Carbamate	
methyl parathion L	28	triallate ED (<i>Far-Go</i>)	42
fonofos EC (<i>Dyfonate</i>)	14		
Pyrethroid		Dinitroaniline	
cypermethrin WP (<i>Ammo, Cymbush</i>)	55	trifluralin EC (<i>Treflan</i>)	55
cypermethrin EC (<i>Ammo, Cymbush</i>)	25		
cyfluthrin WP (<i>Baythroid</i>)	10	Triazine	
cyfluthrin EC (<i>Baythroid</i>)	30	atrazine FL (<i>Aatrex</i>)	21
deltamethrin EC (<i>Decis</i>)	48	atrazine WP (<i>Aatrex</i>)	11

FL - flowable liquid; WP - wettable powder; EC - emulsifiable concentrate. Source: Nelson, C., J. Laughlin, C. Kim, K. Ragakis, M. Rahell and L. Scholter. 1992. Laundering as decontamination for apparel fabrics; residues of pesticides from six chemical classes. *Archives of Environmental Contamination and Toxicology* 23: 85-90.

Respiratory Devices

Note: Graphics of this publication adapted from National Safety Council's Pocket Guide For Respiratory Protection and USDA/EPA Bulletin #825—Applying Pesticides Correctly.

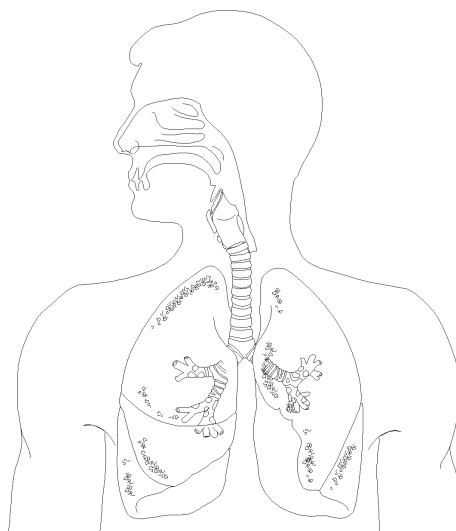
Respiratory Protection

Your respiratory system is one of the most vital and easily injured parts of your body. The respiratory system includes your nose and mouth, throat, trachea (windpipe), bronchi, and lungs. The primary purpose of your respiratory system is to provide oxygen to the body. Oxygen passes from the lungs directly into the bloodstream.

Inhaling a pesticide can cause many different health problems. What happens to your respiratory system and the rest of your body depends on several factors. These factors include the type and toxicity of the pesticide, the type and size of the particles inhaled, and the amount inhaled.

Harmful effects from inhaling a pesticide could include:

- Damage, irritation, or obstruction within the respiratory system;
- Acute poisoning if pesticides are transported into the bloodstream through the lungs;
- Long-term health effects resulting from pesticides being brought into the body.



Wear a good quality respirator to protect yourself from the risks of pesticides entering the respiratory system. A properly fitted and maintained respirator will help protect you from the damaging effects of airborne pesticides.

How does a respirator work?

A respirator is a protective device used to keep pesticides out of the lungs. Respirators work in one of two ways: they either purify the air or supply clean air.

Air purifying respirators filter the air you breathe. Air supplying respirators provide you with clean fresh air from outside, either through a pressurized air tank (often carried on the user’s back) or through an air hose.

There are many variations of respirator designs within these two categories (air supplying and air purifying). To be fully effective, the respirator should be used only in the way the manufacturer recommends.

When should a respirator be worn?

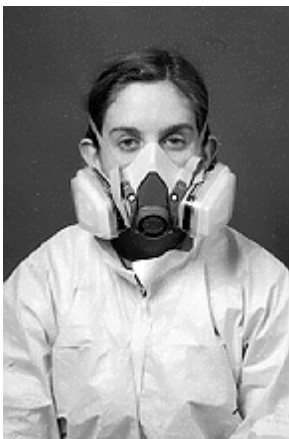
Wear a respiratory protective device if there is any risk of inhaling pesticide vapors or fumes, especially if the label states “Do not breathe vapors or spray mist” or “Harmful or fatal if inhaled.” The risk of inhaling pesticides is greatest:

- If you are exposed to pesticides for long periods.
- If you dilute or mix concentrates.
- If you use sprays or dusts.

- If you work with highly toxic pesticides.
- If you work in an enclosed area.

The Worker Protection Standard (WPS) says that the product label must specify when a respirator is to be used and what type should be used. For example, the label might state that “A dust/mist respirator (MSHA/NIOSH approval number prefix TC-21C) is required when handling or mixing this product.” The devices can be obtained from farm supply stores and safety equipment companies (located mainly in larger cities). Make sure the equipment has a NIOSH/OSHA seal of approval. This indicates that the item has been tested and certified to provide protection against the listed contaminants.

Even if the label does not require one, wearing a good, properly fitted respirator can help minimize your overall exposure potential.



Example of "TC-23" cartridge respirator.

Types of Respiratory Devices

There are several types of respiratory devices. Each type is useful for certain activities. There is no all-purpose device. Make sure you use the correct one. Always read and follow instructions on the product label.

How to choose the right type of respirator

The label will specify the type of respirator for a given pesticide and task. In the previous example, notice that the respirator type was given including a “TC” (Tested and Certified) number. This number shows that a respirator has been tested and certified by the Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH). The number following the TC designation specifies the actual type of respirator (examples are described below). Only approved respirators carrying the MSHA/NIOSH certification should be used. Noncertified respirators are often available in hardware or department stores, but will not provide adequate protection.



Exploded view of cartridge respirator.

Dust/mist respirators

A TC-21C is a mask designed to screen out solid dust and liquid mist particles. An approved dust/mist respirator will have two straps to assure a tight fit and adequate seal. Some models also have an exhale valve and a “nose clip” to help prevent leakage and improve comfort.

Cartridge respirators

A TC-23C is a respirator with cartridges. These cartridges contain charcoal or other material that selectively “grabs onto” the organic vapors found in many pesticides, while allowing a supply of clean, fresh air to pass through. A NIOSH-approved cartridge respirator for most pesticides will have a black label or band on the cartridge. Most cartridge-style respirators can also be fitted with dust/mist prefilters that snap onto the top of the cartridge for added protection against dusts and mists. You can also buy the TC-23C respirator as a “full-face” respirator that combines the respiratory protection provided by the cartridges with eye and face protection.

Full-face chemical cartridge respirator

This is a cartridge respirator that also protects eyes and face. It may be used with a pesticide cartridge when you are exposed to pesticides for a short time, such as when diluting or mixing pesticide concentrates or

spraying or dusting animals. Use it with an ammonia cartridge when transferring anhydrous ammonia to nurse tank or from nurse tank to applicator.

Full-face chemical gas mask with canister

Pesticides with a higher level of toxicity may require either a TC-14G gas mask respirator or a TC-13F self-contained breathing apparatus. Gas mask respirators (TC-14G) are similar in function to cartridge respirators but have a much greater capacity to absorb toxic substances. Gas masks also generally provide eye and face protection.

Warning: The respirators described thus far (dust/mist and gas masks) must NOT be used in areas where there is a lack of oxygen (less than 19.5%) or where toxic gases are present. Such areas include, but are not limited to, silos, manure pits, and fumigated grain storage areas.

Devices for Fumigants or Other Toxic Gases

If you are using fumigants, or are exposed to toxic gases, or are working in an area where there is a lack of oxygen you **must** use an air supplying respirator. Two of the most common types of air supplying respirators are described below.

Self-contained breathing apparatus (SCBA)

Self-contained breathing apparatus (SCBA) respirators (TC-13F) supply the user with clean, fresh oxygen. This differs significantly from the masks previously described (dust masks, cartridge respirators, and gas masks). Air is supplied through a tube and face piece, which is fed by an air tank on the user's back. An SCBA is the **only** type of respirator that can be used in conditions where oxygen is low (below 19.5%) or where contaminant levels are "Immediately dangerous to life and health." Examples include silos, manure pits, or areas where grain has been fumigated and levels of phosphine gas exceed 15 ppm.

Positive-pressure air system with emergency escape cylinder

Another type of respirator, often used in greenhouse operations, is the continuous flow, supplied air respirator (TC-19C). It uses a full face piece, similar to an SCBA, but has a remotely located pump to supply air through a hose to the user. With a positive-pressure system, it is extremely important to locate the pump in an uncontaminated area, since the pump does not filter contaminated air!

Powered Air Purifying Respirator (PAPR)

Other types of respirators are sometimes used when mixing, handling, or applying pesticides. For example, people who are not comfortable with a standard dust/mist respirator mask may choose to wear a powered air purifying respirator (PAPR). PAPR units use a motorized blower to bring cool air in through a filter that removes dust or mist particles. Generally, certified PAPR respirators carry the TC-21C designation. PAPR respirators are not a replacement for an air supplying respirator (such as a self-contained breathing apparatus or positive pressure system).



Example of "TC-14G" gas mask respirator



Chemical cartridge and gas mask respirators

How to Assure a Proper Respirator Fit

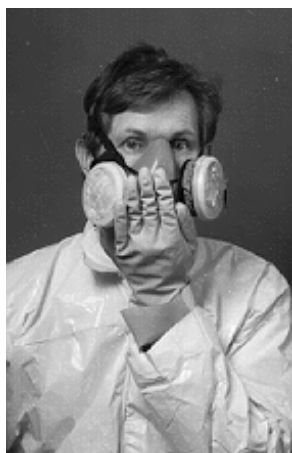
Select a respirator that fits properly. Most pesticide respirators come in different sizes to fit different face sizes and shapes. Beards, sideburns, and mustaches make it impossible to wear a respirator properly. You don't get an adequate seal. Glasses can cause problems, too (especially with full face respirators). There are two ways to determine whether your respirator fits properly: a fit check and a fit test.



Wrong *Right*
Long sideburns, a beard, or glasses may prevent a good seal.

Fit check

A simple "fit check" should be done whenever you put the respirator on. It only takes a few seconds. To check for fit, cover the exhalation valve of the respirator tightly with the palm of your hand. Blow out gently for several seconds. The respirator face piece should bulge out slightly, and you should not feel air leakage around the seal. If you do feel air leaking, readjust the straps, and make sure that the seal touches your face all the way around. If you simply cannot get a good fit, try a different size or different style respirator.



Simple fit check.

Fit test

The fit test is required by most industries with a formal respiratory protection program under OSHA regulation 1910.134. In most fit tests, the user wears the respirator and is exposed to a harmless substance in an enclosed area. If the wearer can smell or taste the substance, the respirator does not fit properly. The references given at the end of this chapter can provide additional information on fit testing procedures and equipment.

How to Care For and Maintain a Respirator

Proper care and maintenance of respirators will help them work effectively. Cleaning helps to reduce the possibility of exposure to pesticides and other substances that can accumulate on respirator parts. The respirator should be disassembled and cleaned when the face piece appears dirty or daily when handling more toxic pesticides. Instructions for cleaning usually come with your respirator. Generally, you should remove the cartridge and wash the face piece with warm soapy water, then rinse and dry it. Always store your respirator in a clean, dry location out of sunlight.

Replace cartridges or canisters as directed by the respirator's instructions.

Exclusive use

People should never "share" a respirator, since certain illnesses and disease can be spread through contact with a respirator parts, especially when not properly cleaned. If you must share a respirator, properly clean and sanitize the respirator.

Storage

Respirators should be stored in a clean, dry location, preferably in a plastic bag. Sunlight is also detrimental to respirator performance and can cause rubber or silicone face pieces to crack and weather prematurely.

Remember: Since a respirator protects only your breathing passages and lungs, you still need to wear protective clothing on other parts of your body.



Fit test procedure



Proper cleaning is crucial

Heat Stress

Heat stress occurs when your body is subjected to more heat than it can cope with. Heat stress is not caused by exposure to pesticides, but may affect pesticide handlers who are working in hot conditions. Personal protective equipment worn during pesticide handling activities can increase the risk of heat stress by limiting your body's ability to cool down.

Signs and Symptoms of Heat Stress

Mild forms of heat stress will make you become tired sooner, feel weak, be less alert, and be less able to use good judgment. Severe heat stress is a serious illness. Unless victims are cooled down quickly, they can die. Severe heat stress is fatal to more than 10 percent of its victims, even young, healthy adults. Many who survive suffer permanent damage, and sometimes remain sensitive to heat for months. Learn the signs and symptoms of heat stress and take immediate action to cool down if you suspect you may be suffering from even mild heat stress.

Signs and symptoms may include:

- Fatigue (exhaustion, muscle weakness);
- Headache, nausea, and chills;
- Dizziness and fainting;
- Severe thirst and dry mouth;
- Clammy skin or hot, dry skin;
- Heavy sweating or complete lack of sweating;
- Altered behavior (confusion, slurred speech, quarrelsome or irrational attitude).

First Aid for Heat Stress

It is not always easy to tell the difference between heat stress illness and pesticide poisoning. The signs and symptoms are similar. Don't waste time trying to decide what is causing the illness. Get medical help. First aid measures for heat stress victims are similar to those for persons who are overexposed to pesticides.

- Get the victim into a shaded or cool area.
- Cool the victim as rapidly as possible by sponging or splashing skin, especially face, neck, hands, and forearms, with cool water or, when possible, immersing in cool water.
- Carefully remove equipment and clothing that may be making the victim too warm.
- Have the victim, if conscious, drink as much cool water as possible.
- Keep the victim quiet until help arrives.



Clean all parts of the respirator face piece



Store respirators in a clean location

Heat Cramps

Heat cramps can be quite painful. These muscle spasms in the legs, arms, or stomach are caused by loss of body salt through heavy sweating. To relieve cramps, have the victim drink lightly salted water or “sports drinks.” Stretching or kneading the muscles may temporarily relieve the cramps. However, if you suspect that stomach cramps are being caused by pesticides rather than heavy sweating, get medical help right away.

Causes of Heat Stress

Several factors work together to cause heat stress. Before you begin a pesticide handling task, think about whether any of these factors are likely to present a problem, including:

- Heat factors: temperature, humidity, air movement, and sunlight
- Workload
- Personal protective equipment
- Water
- Scheduling

Consider what adjustments you may need to make in the task itself or in the working conditions.

Mixing and Loading Pesticides

The most hazardous part of using pesticides occurs when you mix and load them. At these times, you are handling the pesticide in its most concentrated form, and there is a great risk of exposure and poisoning. Protect yourself and others by following these precautions:

- **Read the label** before opening the container to be sure that you are thoroughly familiar with current use directions.
- **Don't work alone** if at all possible. Let someone—a spouse or a neighbor—know where you are spraying and which pesticides and chemicals you are using.
- **Never eat, drink, or smoke** while handling pesticides. Before eating or drinking, always wash with soap and water—away from the house, if possible.
- **Do not handle pesticides if you are taking medication** that might make you dizzy. Dizziness can cause accidents. Also, the dizziness could be mistaken for a symptom of pesticide poisoning.
- Make sure you wear the **right protective clothing and equipment**.
- Have a plentiful **supply of clean water and detergent available** in the mixing and loading area.
- **Work outdoors** when pouring and mixing pesticides. If you must work indoors or at night, be sure there is good ventilation and enough light.

- If there is any wind, **always stand in the crosswind** so that the wind blows across your body from either side. Don't stand with the wind against your back or face.
- **Open pesticide containers carefully.** Never tear them open—use a sharp knife. Clean the knife afterwards and do not use it for other purposes.
- **Always measure materials accurately.** Use only the amount stated on the label.
- When pouring a pesticide, **keep the container well below eye level** to protect your eyes and face from exposure.
- **Always use a pump or threaded and valved piping** if the concentrate has to be removed from a drum or other large container.
- **Replace pour caps and close bags** or other containers immediately and return them to the storage area.
- Consider using **formulations of pesticides that reduce applicator risk.**
- When adding water to a spray mixture, **keep the hose or pipe above the level of the mixture** at all times. This will prevent the pesticide from backsiphoning into the water source. For extra protection, the water hose should be equipped with a check valve or other device to prevent backsiphoning.
- **Add emulsifier or spreader-sticker shortly before the tank is completely full** if you use one. These materials tend to cause foaming.
- **Be extremely careful to avoid overflow.** Never leave a spray tank unattended while it is being filled.
- If a metal or plastic container has been emptied, **triple-rinse or pressure-rinse** it and empty the rinse water into the spray tank. Measuring cups should also be rinsed and the rinse water emptied into the spray tank.
- **Thoroughly clean all mixing and loading equipment** after each use. (See Part 8— Equipment: Selecting, Calibrating, Cleaning for instructions on cleaning equipment.)
- If you splash or spill a pesticide while mixing or loading, **stop what you are doing immediately and clean up the spill.** If any concentrate has spilled on your clothes, remove the contaminated clothing. Remember that all spills must be reported to the Minnesota Department of Agriculture. Speed is essential.

Closed Handling Systems

You can reduce exposure to concentrated pesticides by using a closed handling system. This system is a series of interconnected equipment that allows you to remove a pesticide from the original container, rinse the empty container, and transfer the pesticide and rinse solution to the spray tank without coming into contact with the pesticide. Closed handling systems are also being developed for dry products.

The advantages of a closed handling system are increased safety, less need for protective clothing and equipment, fewer spills, and more accurate measurement.

Many different types of closed handling systems are appearing on the market. Some involve major changes in container design or package, but are very simple to use. Other systems may be more complicated and cumbersome.

Some pesticide labels require the use of closed handling systems. This requirement may become more common in the future.

Storing Pesticides

The way to store pesticides is almost as important as how they are used. If pesticides and pesticide handling equipment are not stored in a safe place, accidents can happen: children and livestock can be poisoned, air, water and soil can become polluted, pesticide containers can be damaged, and pesticides can be ruined. Legal requirements for pesticide storage areas may change and the storage of bulk pesticides have additional requirements. Contact the Minnesota Department of Agriculture for current storage regulations.

Read the label to see if any special steps should be taken before storing the pesticide. Then store the material immediately.

Storage Containers

Store pesticides in their original containers with the labels intact. Never put pesticides in other containers, such as pop bottles, feed bags, or open buckets.

If you have any unlabeled containers, dispose of them. You can't expect to remember such things as contents, directions, precautions, and antidotes.

Check periodically for leaking containers. If a container is defective, it should be repaired. If this is not possible, then transfer the contents to another container with an intact label which has held exactly the same product. Then dispose of the defective container in a proper manner.

Storage Areas

Store pesticides in a locked storage room or cabinet where children, unauthorized people, or animals cannot enter. Make sure the windows are tight; board them up if necessary.

The storage facility can be in a separate building or in a separate area within a building. The area should be used only for pesticides and pesticide equipment. **Never** store pesticides with food, feed, seed, planting stock, fertilizers, veterinary supplies, clothing, respirators, or other protective equipment.

Locate the storage building downwind and downhill from sensitive areas such as houses, recreational areas, schools, or barns.

The storage area should have a concrete floor which is impermeable (that is, it will not let fluids pass through) and easy to wash.

Ideally, the structure should be fire-resistant. If you store large amounts of pesticide, install fire-detection devices and have fire extinguishers and other firefighting equipment readily available. As an extra precaution, let your fire department know that you have large quantities of stored pesticides, giving them the location and the kind of pesticides. Post warning signs for firefighters and others.

The storage area should be well lit, well ventilated, and well insulated against extremes in temperature.

Never allow pesticides to become overheated. Do not store them close to any source of heat. Heat may cause liquid formulations to expand, and an accident could occur when the containers are opened. Some pesticide formulations catch fire if they become overheated.

Protect pesticides, especially liquids, against freezing. Some pesticide formulations separate at low temperatures, making it difficult or impossible to mix them. Low temperatures can also cause pesticide containers to rupture. The labels of most liquid products state the lowest temperatures allowed for safe storage.

Store dry formulations packaged in sacks, fiber drums, boxes, or other water-permeable containers on pallets or metal shelves. Do not store dry materials below shelves containing liquid material—if the liquids leak, they could contaminate the dry formulations.

Place metal pesticide containers on pallets or shelves to help reduce corrosion.

Have the following supplies available in the storage area:

- Detergent
- Hand cleaner
- Water
- Absorbent material such as absorbent clay, sawdust, vermiculite, kitty litter, or paper to soak up spills
- Shovel
- Broom and dustpan
- Fire extinguisher rated for ABC fires.

A pesticide storage facility should never be used for other purposes, even if pesticides are no longer stored there. It is almost impossible to totally decontaminate a pesticide storage facility.

How Long Can Pesticides Be Stored?

Before storing pesticides, mark the date of purchase on the container. The shelf life is difficult to predict; manufacturers usually recommend no more than two years. Once a container is opened, the shelf life is greatly reduced.

One of the best ways to reduce the need for storage is to buy only the amount needed for immediate use. If you need to keep a larger inventory, use the older materials first.

Reporting of Pesticides Stored on the Farm

Under the federal Superfund and Reauthorization Act (SARA) Title III, persons storing, for even a few hours, certain hazardous substances must notified the State Emergency Response Commission. This notification will help state and local emergency response personnel to plan and respond to fires, spills and accidents where hazardous materials may be present. Notification is required if large enough amounts of anhydrous ammonia and a number of pesticides are stored on a farm at any one time. Part 2—Pesticide Laws has more information on notification.

Disposing of Pesticide Wastes

Improper disposal of pesticide wastes can create serious hazards for humans and the environment. These wastes include excess pesticides, empty pesticide containers, and materials containing pesticide residues.

Excess and Waste Pesticides

The Minnesota Waste Pesticide Collection Program helps pesticide users dispose of waste pesticides safely, economically, and conveniently. About 340,000 pounds of waste pesticides have been collected and properly destroyed in the first three years since the program began in 1990.

Pesticides become wastes when they become unusable as originally intended. Some undergo physical changes as a result of improper storage or age. Some pesticide products cannot be used because of state or federal restrictions prohibiting their use; an example is DDT. When the label is off the pesticide container it is considered a waste pesticide because it is no longer possible to know what pesticide the container holds. Dispose of unlabeled pesticide containers. Unknown, unlabeled pesticides contribute a significant percentage of the waste pesticides brought to collections.

Waste pesticides must be disposed of according to EPA and state regulations. It is illegal to bury, burn, or discard a pesticide or its container in a manner inconsistent with instructions found on the label. State sponsored waste pesticide collections provide a means for pesticide users to remove these wastes and comply with the law while ensuring the safety of our environment.

All waste pesticides are eligible for disposal through the Waste Pesticide Collection program. The simple guidelines require an inventory of waste and contact with the Minnesota Department of Agriculture. The state provides collection opportunities in each county every other year. More information about waste pesticide collection programs may be obtained by calling the Minnesota Department of Agriculture at 612-297-7102 or 1-800-657-3986.

Waste pesticide is a problem. You can help reduce potential problems by following the guidelines below.

Practices and Techniques for Waste Pesticide Reduction

- Use Integrated Pest Management practices to avoid unnecessary pesticide use.
- Purchase only the amount needed to reduce the need to store extra materials.
- Store all pesticides in a well ventilated, dry, and safe areas free from accidental mechanical contact and temperature extremes.
- Make sure all containers are labeled.

Management of Containers

Rinsing plastic, glass, and metal containers

Pressure- or triple-rinse all empty containers. All empty rigid plastic, glass, and non-pressurized metal pesticide containers must be properly rinsed before they can be recycled, disposed, or reconditioned. This is the most important step in handling of empty pesticide containers.

Proper rinsing is required by federal and state regulations and is a good, sound agricultural and environmental practice. Containers that have been properly rinsed pose less hazard to people and the environment than unrinsed containers.

Rinsing at the time of use allows the rinse water to be added into the spray tank. This eliminates the need to store unrinsed containers and to store the rinse water. In addition, some pesticides will solidify quickly and be difficult to clean from the container if not rinsed immediately.

Properly **rinsed** pesticide containers should be stored separate from regular pesticide storage areas (preferably indoors), as well as separate from containers waiting to be properly rinsed. Container storage locations should be managed so that unrinsed containers are not placed with properly rinsed containers.

Empty unrinsed pesticide containers must be capped, stored upright in a secure (locked) areas, and placed on an impervious surface. Unrinsed pesticide containers must be stored separate from pesticide containers that have been properly rinsed. Rinsing empty pesticide containers after the contents have dried may require additional steps and/or the use of cleansing material for rinsing. The best tactic is to rinse containers when the pesticide is used to avoid having any unrinsed containers to store.

Two different procedures are effective for proper rinsing of pesticide containers: pressure-rinsing and triple-rinsing.

Pressure-rinsing

In pressure-rinsing, a special nozzle is attached to the end of a hose to force the remaining pesticide from the container. Pressure-rinsing, which may be faster and easier than triple-rinsing, and can be used with plastic and non-pressurized metal pesticide containers.

To pressure-rinse containers:

1. Empty contents of container into spray tank, turning the container so that any product trapped in the handle is allowed to flow out. Once flow is down to a drip, allow the container to drain for an additional 30 seconds.

2. Immediately begin rinsing procedures or the product may become difficult to remove.
3. Hold the container so the opening can drain into the spray tank.
4. Force tip of the pressure nozzle through the lower portion of the side closest to the handle.
5. Connect nozzle to a clean water source of at least 40 psi. Turn the nozzle inside the container to assure good coverage of all sides, including the handle.
6. Rinse for at least 30 seconds.
7. Drain all rinse water into the spray tank.

Triple-rinsing

Rinse the container three times. Triple-rinsing can be used with plastic, non-pressurized metal, and glass containers.

To triple-rinse containers:

1. Empty contents of container into spray tank, turning the container so that any product trapped in the handle is allowed to flow out. Once flow is down to a drip, allow the container to drain for an additional 30 seconds.
2. Immediately begin rinsing procedures or the product may become difficult to remove.
3. Fill the empty container one-fourth full of water.
4. Replace the cap on the container. With the container opening facing left, shake the container left to right over a distance of four to six inches. Shake the container about twice per second for 30 seconds.
5. Drain rinse water into spray tank as described in step 1.
6. Fill the container one-fourth full with clean water a second time.
7. Recap the container. With the opening of the container pointed toward the ground, shake the container as described in step 4. Then drain the rinse water into the spray tank.
8. Finally, fill the container one-fourth full with clean water a third time.
9. Recap the container. With the container in the normal, upright position, shake the container as you did before. Shake with a four- to six-inch vertical motion, twice per second for 30 seconds.
10. Pour the rinse water into the spray tank. Carefully rinse and spray residue from the outside of the container.

There have been recent changes in Minnesota law affecting on farm waste disposal. Currently, the only legal way of disposing of pesticide containers is in an approved landfill or recycling and reconditioning. It is illegal to bury or burn any type of pesticide container on Minnesota farms. Check with local authorities, state agencies, or your local county extension office for more information.

Recycle containers

Properly rinsed containers may be recycled. Large pesticide drums may be returned to the manufacturer or to drum reconditioners. Plastic pesticide containers (agricultural, home, or garden) **should not** be recycled with household plastic recycling programs. Pesticide containers should only be recycled through programs designed for pesticide containers. Dry flowable pesticide in rigid plastic containers should be rinsed.

Safely landfill properly rinsed containers

Private applicators who cannot recycle rinsed containers should have them buried at an approved landfill. Under no circumstances should rinsed containers be carelessly discarded. Keep properly rinsed empty containers in your pesticide storage area until you recycle or dispose of them at an approved landfill.

Paper and other containers

Before disposing of paper, plastic, and composite pesticide bags, make sure they are completely empty. Thoroughly empty the contents into application equipment. Then dispose of the bag at an approved landfill. Do not attempt to rinse. If you are not sure whether you should rinse a container or not, **check the label.**

How to dispose of pesticide containers

Type of container	Disposal options
Plastic jugs	Recycle or landfill
Metal	Recycle or landfill
Plastic bags	Landfill
Paper bags	Landfill
Aerosol	Landfill
Mini-bulk	Check with the dealer

Note: Landfill operators are not required to and may not accept pesticide containers. Landfill operators are legally liable for environmental problems that may occur because of unrinsed containers or paper and plastic pesticide bags in their landfill.

Other Pesticide Wastes

Excess pesticide mixtures

Excess pesticide mixtures include:

- Leftover solutions after spraying is done.
- Water used to wash the outside or rinse the inside of the sprayer.
- Spray left in the boom or hoses.
- Haul-back solutions from a spraying job interrupted by weather or equipment breakdown.

- Small quantities of material spilled during mixing.

Excess pesticide mixtures should be collected and used again. They can be used on a crop or other site listed on the label or stored for mixing future solutions of the same pesticide. To make it easy to collect these excess pesticide mixtures, mix pesticides and clean equipment on an asphalt or cement pad equipped with an aboveground tank to hold runoff.

Diluting the pesticide will not solve the hazardous waste problem. In fact, it can make it worse. Ten gallons of hazardous waste diluted with 90 gallons of water creates 100 gallons of hazardous waste. Likewise, mixing hazardous waste with nonhazardous waste makes the whole mixture hazardous.

Other materials

Other types of materials that must be disposed of properly include:

- Contaminated material from the cleanup of spills.
- Clothing on which liquid concentrates have spilled.
- Pesticides that have been damaged by fire, water, or other substances.
- Pesticides that have been stored beyond their shelf life.
- Pesticides with some or all uses canceled.

Contaminated clothing and similar small items can be enclosed in a plastic bag and thrown into the garbage. For other pesticide materials, check with the Minnesota Department of Agriculture (MDA) before you dispose of them. The MDA may recommend that these materials be used in some way according to the label. If the MDA finds that the contaminated material cannot be reused, then it will be considered a pesticide waste. Information on proper disposal of these pesticide wastes can be obtained from the Minnesota Department of Agriculture.

What to Do if There Is a Spill or Fire

Be Prepared

Pesticide spills can be a serious threat to humans, livestock, and the environment. By knowing in advance just to do when a pesticide spill or fire occurs you may reduce the danger. While fertilizer spills are also a concern and are covered by the same state law requirements this section will focus only on pesticides.

Know your pesticides

Have available Material Safety Data Sheets (MSDS) or emergency response information for the products used so you know how to handle a specific pesticide during an emergency. These may be obtained from the manufacturer.

Report pesticide spills

According to state law, you must report incidents involving pesticides, even ones that you may consider minor. This includes leaking containers, spills, exposure, poisoning, motor vehicle accidents, tornadoes, fires, and floods. Under Minnesota law all incidents (releases, spills, etc.) involving agricultural chemicals must be immediately reported by the responsible party or owner or real property to the Minnesota Department of Agriculture Incident Response Program, except for incidents which meet ALL of the following conditions:

1. the responsible party or owner of real property is a licensed commercial or certified private applicator; AND
2. the total amount of pesticide involved in the incident at the site over the entire year is less than what can be legally applied (labeled rates) to one acre of agricultural cropland; AND
3. the incident was not into or near public water or ground water.

Please remember that an agricultural chemical incident must be reported to be eligible for Agricultural Chemical Response and Reimbursement Account (ACRRA) reimbursement of cleanup costs.

Important telephone numbers to know

To report pesticide spills: The Minnesota Department of Public Safety, Division of Emergency Management (DEM) can be reached 24 hours a day.

In the Twin Cities call 651-649-5451

In Greater Minnesota 1-800-422-0798

Ask the DEM to notify all appropriate state agencies for you, including the Minnesota Department of Agriculture.

For spills involving large amounts of pesticide, highly toxic chemicals, or extensive contamination, additional information may be obtained by contacting the Pesticide Safety Team Network through

CHEMTREC at 1-800-424-9300

These experts are ready 24 hours a day to give advice on how to handle emergencies.

Local emergency response or fire

call 911

Pesticide poisoning call the Poison Center for your area. They can provide quick information for treating victims of pesticide poisoning.

All of Minnesota: 800 - POISON1 (800-764-7661)

Wear protective clothing

Whenever you work with pesticides wear protective clothing. If you are transporting pesticides, carry protective clothing with you in the car or truck in case there is a spill. Always wear protective clothing when handling a spill.

If a Spill Occurs

Here is a list of things to do if a spill occurs.

1. **Act quickly.** If a spill occurs, it must be taken care of immediately. Any delay could cause serious contamination. It could also be very costly to pay someone to clean up a spill that was allowed to spread.
2. **Protect yourself.** Do not expose yourself to the chemical. Wear protective clothing and equipment as required by the pesticide label. If someone is injured, make sure you are properly protected before you try to help them. You are not going to be able to help anyone if you become injured, too. Safety in responding to a spill is important. If you cannot safely control or contain the spill, then do not do it. Obtain expert assistance and advice on how to proceed.
3. **Control the spill.** The “Three C Program” for spills stands for: Control the spill, Contain the spill, and Clean up the spill. Whether you are dealing with just one leaking container or with an overturned truck on a public highway, always use this basic “Three C Program.” Control the spill or leak by stopping it if it is possible to do so safely. If a small container is leaking, put it into a larger container to contain the pesticide.
4. **Contain the spill.** Prevent the spill from spreading if it can be done safely. Keep it in as small an area as possible. It is most important to keep all chemicals from getting into any body of water, including storm sewers and tile lines. Do not hose down the area. This will cause further spread of the chemical.

Construct a dam to prevent the pesticide from spreading. If it is a liquid, spread absorbent materials such as fine sand, vermiculite, sawdust, or clay over the entire spill. Kitty litter is very useful for containing and cleaning up small spills or minor leaks.

For dusts, wettable powders, or granular materials a light misting with water or covering the spill with a plastic cover will help to reduce the spill from spreading. The plastic cover must be properly discarded later.

5. **Guard the site.** Isolate the contaminated area to keep people away. Rope it off if possible. Do not let anyone come any closer than 30 feet. It may be necessary to evacuate people downwind from the spill. Avoid any drift or fumes that may be released. Do not use road flares if the leak may be flammable.
6. **Notify the authorities.** For any kind of pesticide spill, the Minnesota Department of Agriculture (MDA) must be notified immediately. If the spill occurs on a public road, also have someone alert state, county, or local police using 911.

When you call, give the following information:

- Your name.
- Where you can be reached.
- Where the spill is.

- Type of pesticide.
- What time the spill occurred.
- The source of the spill.
- How much material was spilled and for how long.
- Whether the material is spreading.
- Nearby surface water or wells.

7. **Clean up the spill.** The Minnesota Department of Agriculture will give you guidance and assistance on cleaning up a spill and handling contaminated materials. Cleaning up some spills may be easy. Other spills may require more complex procedures. The MDA will give you recommendations on each of these steps. The procedures will vary, depending on the following factors:

- The pesticide involved in the spill.
- The extent of the spill.
- The location of nearby wells, surface waters, and other vulnerable sites.
- Soil type.
- Materials contaminated.

In general, there are three steps in cleaning up pesticide spills:

1. Remove the spilled pesticide.
2. Decontaminate the spill area.
3. Clean contaminated equipment.

It may be possible to reuse some of the spilled or contaminated materials. The MDA will provide information and recommendations on handling these materials. The recommendations may include applying the materials to labeled sites at or below labeled rates for that pesticide. If the materials cannot be used, then they are considered waste and come under the jurisdiction of the Minnesota Pollution Control Agency (PCA). The PCA will provide information on how to dispose of these waste materials.

Clean up all vehicles and equipment involved in an accident or cleanup. Be sure to wear protective clothing as required by the pesticide label. Use a solution of liquid bleach and alkaline detergent (dishwasher detergent) to clean equipment. Porous material and equipment such as brooms, leather shoes, and cloth hats cannot be decontaminated, they must be discarded or destroyed after clean up.

If a Fire Occurs

Most of the active ingredients in pesticides are not flammable. But many of the solvents used in liquid formulations are highly flammable. All liquid pesticides and some wettable powders are potential fire hazards.

If you store large quantities of pesticides, it is recommended to install fire-detection devices and have fire extinguishers handy. Inform your fire department about any large quantities of stored pesticides. This is an

important safety precaution to follow in case a fire breaks out when you are not available.

In the event of a fire, the main goals are:

Protect people from smoke and fumes.

Contain the fire.

Prevent contamination of surrounding areas.

As soon as you detect a fire, call the fire department. Tell them what pesticides are involved and give specific information that may help fight the fire and protect themselves and others from injury.

Remove all people from the area to a safe place upwind of smoke and fumes. Isolate the entire area. Keep spectators away.

Fighting pesticide fires require extreme caution. Fire fighters should follow these guidelines:

Wear protective clothing and equipment, including liquidproof gloves, boots, full body covering, and a hat. Respirators may be necessary. If a burning structure must be entered to rescue someone, the rescuer must use a self-contained breathing apparatus to protect against toxic vapors and lack of oxygen.

Always **approach the fire from the upwind side** and from a safe distance.

Be aware that pesticide containers might explode. Nearby containers should be moved or kept cool.

Do **not** attempt to save burning chemicals.

Be especially careful about using water to fight the fire. Contaminated runoff may create a more serious problem than the fire. It is sometimes better to simply let a fire burn in order to avoid massive problems with contaminated runoff. A fog spray often works better than a straight stream of water and usually results in less contamination. Whenever possible, use foam or carbon dioxide instead of water. If water is used, build dikes to prevent flow of contaminated runoff into lakes, streams, sewers, or other bodies of water.

Avoid smoke, fumes, mist, and runoff as much as possible. If you suspect that someone has been poisoned by a pesticide, move the person from the fire area, call a doctor or ambulance, and give appropriate first aid (see Part 6—Pesticide Poisoning).

Minnesota's Agricultural Chemical Response and Reimbursement Account

The Agricultural Chemical Response and Reimbursement Account (ACRRA) was created by the 1989 Minnesota Ground Water Protection Act. The ACRRA fund was established primarily to reimburse persons for costs incurred after July 1, 1989, in cleaning up agricultural chemical (pesticide and fertilizer) incidents.

The account is funded by annual surcharges on pesticide and fertilizer manufacturers, distributors, applicators, and dealers. The amount of surcharges levied will largely be determined by the current ACRRA fund balance. The account has a required statutory minimum balance of \$1,000,000 and a maximum balance of \$5,000,000. It is the Commissioner

of Agriculture who determines if the surcharge must be increased.

Moneys from the ACRRA fund can be used for reimbursement of costs resulting from cleanup of sudden incidents, such as fire or transportation accidents, or can be used to reimburse persons for cleaning up sites contaminated with agricultural chemicals.

Before any reimbursement can be made, the board must determine the following:

- The Minnesota Department of Agriculture (MDA) was given **proper notice** by reporting the incident as required under Minnesota Statutes, Chapter 18D.
- The costs of investigation and cleanup were **reasonable and necessary**; and
- The eligible person complied with corrective action **requests or orders** issued by MDA, or the eligible person took all reasonable action necessary to minimize and abate the incident, and the corrective action was subsequently approved by MDA.

If these conditions are met, the Board may reimburse an eligible person for:

- Ninety percent (90%) of the total reasonable and necessary correction action costs greater than \$1,000 and less than \$100,000; and
- One hundred percent (100%) of the costs equal to or greater than \$100,000 and less than \$200,000.

The Board has authority to reduce reimbursement if the incident was caused by a violation of Minnesota Statutes, Chapters 18B, 18C, or 18D.

For further information about ACRRA, how to participate in the program, and what costs may be covered, contact:

Sharon Huber, ACRRA Administrator
Minnesota Department of Agriculture
651-297-3490

Checklist for Preventing Agricultural Chemical Accidents

Experienced pesticide applicators may become so used to their pesticide equipment and materials that they become careless or take shortcuts. Then an accident can happen.

The following checklist is based on data showing the common causes of pesticide accidents. Check it against the way you handle pesticides and see how many accidents are waiting to happen to you. Just one "No" answer may be the one that gets you in trouble!

Clothing and protective equipment

- Wear the protective clothing and respiratory protection equipment recommended on the pesticide label.
- Start each spraying day with clean clothing.

- Throw away rubber gloves that have tiny holes in them.
- Clean and maintain protective equipment often.

Splashes and spills

- Know what to do if you spill a pesticide while mixing it.
- Always watch the sprayer tank when filling it so it won't run over and spill on the ground.
- Have absorbent clay, sawdust, vermiculite, kitty litter, or other absorbent material on hand to soak up spills.
- **Do not** drain leftover spray mixtures on the ground.

Application equipment

- Equip the sprayer tank and water supply hose with air gap equipment or other device to prevent backsiphoning into the water supply.
- Maintain the equipment so it doesn't leak.
- Discard an old high-pressure hose instead of reinforcing it and hoping that nobody will be nearby when it bursts.
- Clean nozzles with a soft brush and by rinsing.
- Keep spray equipment clean so that those touching it will not be contaminated.
- Always release pressure on the equipment so that spray guns won't be triggered accidentally.

Pesticide application

- Check wind direction and the area downwind before applying pesticide.
- Consider substituting a safer chemical if spraying near a sensitive area.
- Check for the possibility of rain showers and damaging runoff before applying pesticides.
- Plan pesticide application so it will have little or no effect on bees, birds, fish, or other wildlife.
- Remove, turn over, or cover up pet dishes, sand boxes, and plastic pools before spraying near residences.
- Make sure that children and pets are out of the area being sprayed and that they stay out for the re-entry interval.

Storage

- Have a separate space to store pesticides.
- Keep the storage area locked and windows tight, barred, or boarded over.
- Keep all your pesticides in this storage area rather than in the garage, feed room, basement, porch, kitchen, or refrigerator.
- Protect pesticides from freezing or overheating.

- Place signs on the storage area so firefighters and others are warned.
- Always keep pesticides in the original container instead of in old bottles, milk cartons, or other food containers.
- Have a label handy to remind you of precautions, antidotes, and directions when you put pesticides in unlabeled transfer containers or sprayers.
- Safely dispose of unlabeled pesticides rather than take a chance with your memory.
- Keep your spray equipment where children cannot play on it.

Disposal

- Limit the amount of pesticide waste material you produce.
- Follow the current federal, state, and local guidelines, laws, and regulations for proper disposal of pesticides and pesticide containers.
- Pressure-rinse or triple-rinse empty liquid containers and dump the rinse water into the tank.
- Collect all containers for proper disposal before leaving a job instead of leaving them in the field or at your tank filling station.
- Keep used containers in your storage area until disposed of.
- Puncture, break, or crush containers so they can't be reused.
- Use returnable containers or recycle or recondition empty containers whenever possible.

Summary

Because pesticides may be a hazard to humans, animals, and the environment, you must take special precautions when you handle pesticides and any clothing or equipment that have been exposed to them.

Before you handle any pesticide, read the label carefully and follow the safety recommendations.

To protect your skin and eyes, always wear protective clothing. If there is any risk of inhaling pesticides, wear a respiratory protective device.

All clothing worn while handling pesticides should be washed daily. If an undiluted emulsifiable concentrate spills on clothing, discard the clothing unless it is made of rubber or neoprene.

Be especially careful when you mix and load pesticides. In their concentrated forms they can cause the most harm if they splash or spill. Always stay with a spray tank while it is being filled. Do not let a spray mixture backsiphon into the water supply.

When you apply pesticides, be careful to use the correct amount, to avoid contaminating water, to avoid pesticide drift, and to protect people and animals from exposure.

Thoroughly clean all mixing and loading equipment after each use to remove pesticide residues. Store your equipment where children cannot play on it.

Store pesticides in their original containers with the label intact. Keep them in a separate, locked storage area. Check stored pesticide containers regularly for leaks.

Disposal of pesticides and pesticide containers must be done according to federal and state regulations. Properly rinse empty plastic, glass, and metal pesticide containers and then either recycle them or bury them at an approved landfill. Collect all pesticide container rinse water to use again. Thoroughly empty paper containers before disposing of them.

If a spill occurs, you must control, contain, and clean it up immediately. Do not let it spread to any body of water. Keep people upwind and away from the area. Notify the Minnesota Department of Agriculture by contacting the Division of Emergency Management.

If a fire breaks out, inform the fire department of the type of pesticide. Protect people from smoke and fumes. Avoid using water to put out the fire because of the risk of contaminated runoff.

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