

CHLORINE GAS CATEGORY

STUDY GUIDE

FOR

COMMERCIAL APPLICATORS

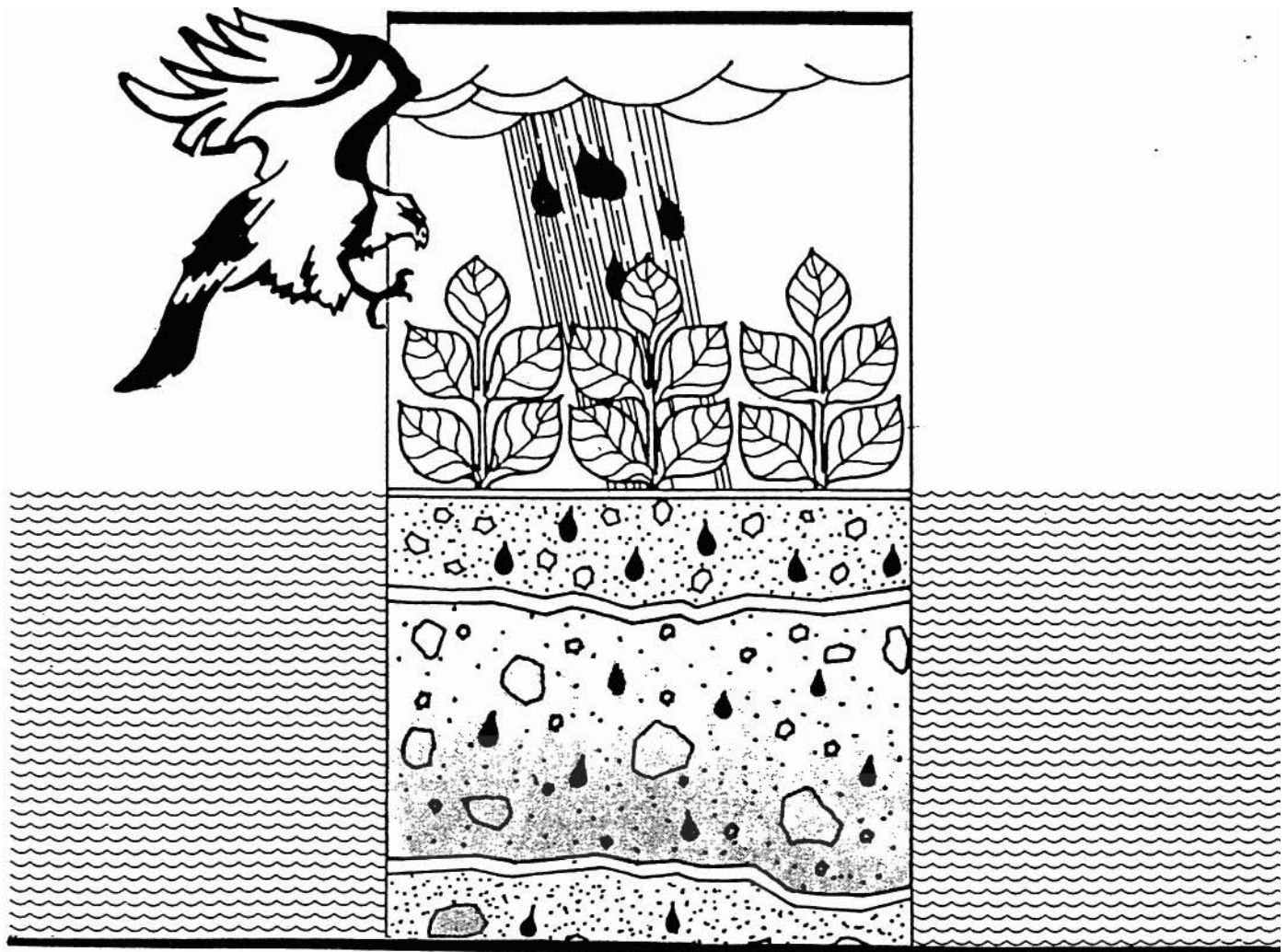
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This manual was compiled and edited by Bob Wells of the Technical Support Section, Division of Agricultural Environmental Services, Florida Department of Agriculture and Consumer Services. Please call (904) 488-6838 for information on Florida's Restricted Use Pesticide Certification program. This document is not copyrighted and may be reproduced.

LAWS AND REGULATIONS

FIFRA



Section I, Laws and Regulations

Pesticide product labeling is the main method of communication between a pesticide manufacturer and pesticide users. The information printed on or attached to the pesticide container is the **label**. **Labeling** includes the label itself, plus all other information you receive from the manufacturer about the product when you buy it. The labeling may include brochures, leaflets, and other information that accompanies the pesticide product. Pesticide labeling gives you instruction on how to use the product safely and correctly. **Pesticide users are required by law to comply with all the instructions and directions for use in pesticide labeling.**

Pesticides are regulated to protect public health and prevent adverse effects on the environment. The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) regulates the registration, manufacture, transportation and use of pesticides. EPA administers FIFRA, which affects you in the following ways:

- All pesticides must be used only as directed on the label.
- EPA may classify pesticides for restricted use.
- Persons who buy restricted use pesticides must be certified pesticide applicators.
- Persons who do not obey the law are subject to fines, jail terms or other penalties.

Pesticide Labeling



PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS (& DOMESTIC ANIMALS)

DANGER:
Fatal if absorbed through the skin, fatal if swallowed, and poisonous if inhaled. Do not breathe vapors or spray mist. Do not get on skin or clothing.

SAFETY PRECAUTIONS - Do not rub eyes or mouth with hands. If you feel sick in any way, STOP work and get help right away. **ON SKIN - IMPORTANT!** If pesticide comes in contact with skin, wash off with soap and water and contact a physician immediately. If handled indoors provide mechanical exhaust ventilation. Always wash hands, face and arms with soap and water before smoking, eating, drinking, or toileting.

PERSONAL PROTECTIVE EQUIPMENT

Applicators and other handlers must wear:
Coveralls over long-sleeve shirt & long-legged pants
Chemical-resistant Gloves such as Butyl or Nitrile
Chemical-resistant Footwear plus socks
Eye Protection
Respirator with an organic vapor-removing cartridge and a prefilter approved for pesticides - MSHA/NIOSH approval prefix (23C) or canister approved for pesticides - MSHA/NIOSH approval number (14G)
Overhead applications: add Chemical-resistant wide-brimmed Hat or Hood
Mixers/Loaders and Cleaners of Equipment: add Chemical-resistant apron

RESTRICTED USE PESTICIDE

Due to very high toxicity to humans and birds. Use only by certified applicators or persons under their direct supervision and only by the certified applicator's certification.

DIRECTIONS FOR USE

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

ENVIRONMENTAL HAZARDS

This pesticide is highly toxic to aquatic invertebrates and wildlife. Birds in treated areas may be killed. Shrimp and other aquatic organisms may be killed at recommended application rates. Do not apply directly to water or wetlands (swamps, bogs and marshes) unless otherwise permitted in Directions for Use. Drift from target areas may be hazardous to aquatic organisms in adjacent aquatic sites.

Do not contaminate water by cleaning of equipment or disposal of wastes.

This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area.

Under the Endangered Species Act, it is a Federal offense to use any pesticide in a manner that results in the death of a member of an endangered species. Prior to making applications, the user must determine that endangered species are not located in or immediately adjacent to the site to be treated. If the user is unsure whether or not endangered species are present, they should contact the U.S. Fish and Wildlife Service Office (Endangered Specialist) or personnel of the State Fish and Game Office.

This product is designed for use and for use by trained operators and equipment. The hazards are reduced by dilution with water for spray applications. Rates of application given below are based on the results of field tests. Do not exceed.

STORAGE AND DISPOSAL

PROHIBITIONS: Do not contaminate water, food, or feed by storage or disposal. Do not store under conditions which might adversely affect the container or its ability to function properly.

STORAGE: Do not store below temperature of 0 F. Store in a safe manner. Store in original container. Reduce stacking height where local conditions can affect package strength. Personnel should wear protective clothing and equipment listed under "PRECAUTIONARY STATEMENTS" when handling open containers.

SPILLED MATERIAL: Block or dike to prevent spreading of spill. Cover with absorbent material such as lime, clay or sawdust. Wash area with strong lye solution, absorb and place in a disposable container.

PESTICIDE DISPOSAL: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal Law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

CONTAINER DISPOSAL: Metals - Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities. Plastic - Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or incinerate.

Section 2, Labels and Labeling

The information printed on or attached to the pesticide container is the **label**. **Labeling** includes the label itself, plus all other information you receive from the manufacturer about the product when you buy it. The labeling may include brochures, leaflets, and other information that accompanies the pesticide product. Pesticide labeling gives you instruction on how to use the product safely and correctly. **Pesticide users are required by law to read and comply with all the instructions and directions for use in pesticide labeling.**

There are many different parts to pesticide labeling. The information is usually grouped under headings to make it easier to find the information you need. Some of the information is required by law to appear on a certain part of the labeling or under certain headings. Other information may be placed wherever the manufacturer chooses. As pesticide information becomes more detailed and complex, information is moved from the product label to supplemental labeling accompanying the product. Applicators must read and understand all of the information on the label and supplemental labeling before using chlorine gas. The information contained on both the label and supplemental labeling is registered by EPA. You must comply with both.

A. Parts Of A Pesticide Label Are As Follows:

1) **Brand Name** - Each manufacturer has brand names for their products. Different manufacturers use different brand names for the same active ingredient. The brand name is the one used in ads and by company sales persons.

2) **Ingredient Statement** - Each pesticide

label must list what the active ingredients are and the percentage amount of each ingredient listed. Inert or inactive ingredients usually are not named, but the label must show what percentage of the total contents they comprise.

3) **Chemical Name** - The chemical name identifies the chemical components of the pesticide. This name is listed in the ingredient statement on the label.

4) **Common Name** - Because some pesticides have active ingredients with complex chemical names, many are given shorter "common names". Only common names that are officially accepted by EPA may be used in the ingredient statement.

5) **Type of pesticide** - The type of pesticide is usually listed on the front panel of the pesticide label. This statement usually indicates, in general terms, the intended purpose of the product.

6) **Type of formulation** - Pesticides are rarely made up of only active ingredients. Usually they are combined with inert chemicals in a mixture called a pesticide formulation.

7) **Net Contents** - This statement appears on the front panel of the pesticide label. It indicates the volume of the formulation held by the container.

8) **Manufacturer's Name and Address** - The law requires the manufacturer or anyone who repackages a pesticide product to put this information on the label and labeling. This is so you will know who to contact for additional information.

9) **Registration Numbers** - An EPA registration number must appear on each pesticide label. It indicates the pesticide product has been approved by the EPA. This number will be useful in cases of accidental poisonings.

10) **Establishment Numbers** - This number identifies the facility that manufactured or repackaged the pesticide product.

B. Signal Words And Symbols

Every pesticide label must display a signal word that indicates how toxic the pesticide is to humans. The signal word is based on the acute (short term) toxicity of the formulated pesticide; therefore, it reflects both the acute toxicity of the active ingredients and that of the inert ingredients.

The signal word represents the highest acute toxicity obtained from five separate tests: oral toxicity, dermal toxicity, inhalation toxicity, eye irritation potential, and skin irritation potential. Knowing the product's acute toxicity helps you choose the proper precautionary measures for yourself, your workers and other persons who may be exposed. The signal word must appear in large letters on the front panel of the pesticide label. It immediately follows the statement "Keep Out Of Reach Of Children".

1) **Danger** - This word signals that the pesticide is highly toxic for one or more of the toxicity tests.

POISON AND THE SKULL AND CROSSBONES SYMBOL - All pesticides that are highly toxic orally, dermally or through inhalation also carry the word "POISON"(printed in red) and the skull and crossbones symbol. Pesticides that have the signal word "DANGER" due only to skin or eye irritation potential do not carry the skull and crossbones symbol or the word "POISON". Chlorine gas has the signal word "Danger" and also the label carries the red skull and crossbones symbol with the word "Poison" in red.

2) **Warning** - This signals that the pesticide is moderately toxic. Any pesticide whose highest acute toxicity is rated as moderate

has the signal word "WARNING".

3) **Caution** - This word signals that the pesticide is slightly toxic. Any pesticide whose highest acute toxicity is rated as low has the signal word "CAUTION".

C. Statement Of Practical Treatment (First Aid)

Most pesticide products are required to include instructions on how to respond to an emergency exposure involving that product. The instructions usually include first aid measures and may include instructions to seek medical help.

D. Hazards To Humans and Domestic Animals

ACUTE EFFECTS STATEMENTS - The label or labeling will contain statements that indicate which route of entry (mouth, skin, eyes, lungs) you must particularly protect and what specific action you need to take to avoid acute effects from exposure to the pesticide. These statements may be on the front or side panel of the label, or they may be located somewhere else in the labeling. The statements will warn you if you may be harmed by swallowing or inhaling the product or getting it on you skin or in your eyes.

E. Delayed Effects Statements

If the Environmental Protection Agency has determined that a pesticide may cause delayed effect, its label must warn you of that fact.

F. Allergic Effects Statement

If tests or other data indicate that the pesticide product has the potential to cause allergic effects, such as skin irritation or asthma, the product labeling must state that fact. Sometimes the labeling refers to

allergic effects as "sensitization".

G. Personal Protective Equipment Statements

The labeling usually lists personal protective equipment requirements immediately following the statements about acute, delayed, and allergic effects. These statements tell you the minimum personal protective equipment that you must wear when using the pesticide. Sometimes the statements will require different personal protective equipment for different pesticide handling activities. For example, an apron may be required only during mixing and loading or equipment cleaning. Sometimes the statements will allow reduced personal protective equipment when you use safety systems, such as closed systems or enclosed cabs.

H. Environmental Hazards

This section of the pesticide labeling will indicate precautions for protecting the environment when you use the pesticide. Some general statements appear on the labeling of nearly every pesticide.

I. Physical Or Chemical Hazards

This section of the pesticide labeling will tell you of any special fire, explosion, or chemical hazards the product may pose. For example, it will alert you if the product is so flammable that you need to be especially careful to keep it away from heat or open flame, or if it is so corrosive that it must be stored in a corrosion-resistant container. When pesticides are flammable, smoking while handling them is extremely hazardous.

If there are no unusual physical or chemical hazards, there may be no statement in the labeling.

J. Directions For Use

Directly under the heading "Directions for Use" on every pesticide product labeling is the following statement: "It is a violation of Federal law to use this product in a manner inconsistent with it's labeling." The Directions for Use section also contains sections on storage and disposal and may contain a section on entry into treated areas after a pesticide application. In addition, the Directions for Use section will contain the specific directions for using the product.

K. Use Inconsistent With The Labeling

It is illegal to use a pesticide in any way not permitted by the labeling. A pesticide may be used only on the plants, animals, or sites named in the directions for use. You may not use higher dosages, higher concentrations, or more frequent applications. You must follow all directions for use, including directions concerning safety, mixing, diluting, storage, and disposal. You must wear the specified personal protective equipment even though you may be risking only your own safety by not wearing it. The use directions and instructions are not advice, they are requirements. Federal law does allow you to use pesticides in some ways not specifically mentioned in the labeling. Unless you would be in violation of the laws of your State or tribe, you may: 1) apply a pesticide at any dosage, concentration, or frequency **less** than that listed on the labeling; 2) apply a pesticide against any target pest not listed on the labeling if the application is to a plant, animal, or site that is listed or; 3) use any appropriate equipment or method of application that is not prohibited by the labeling.

L. Entry Statement

Some pesticide labeling contains a precaution about entering a treated area after application. This statement tells you

how much time must pass before people can enter a treated area except under special circumstances.

M. Storage And Disposal

All pesticide labeling contains some instructions for storing the pesticide. These may include both general statements, such as "Keep out of reach of children and pets," and specific directions, such as "Do not store in temperatures below 32 degrees Fahrenheit."

Pesticide labeling also contains some general information about how to dispose of excess pesticide and the pesticide container in ways that are acceptable under Federal regulations. State and local laws vary, however, so the labeling usually does not give exact disposal instructions.

Storage and disposal statements usually appear in special section of the labeling titled "Storage and Disposal."

N. Directions For Use By Reference

Some directions for use that pesticide users must obey are contained in documents that are only referred to on the product label. Such instructions include EPA or other Government agency regulations or requirements concerning the safe use of the pesticide product. For example, a Chlorine gas label might state: *Directions for Use General Classification ...It is a violation of Federal law to use this product in a manner inconsistent with the labeling. Have available gas masks approved by the U.S. Bureau of Mines or the National Institute for Occupational Safety and Health. Handle this product in accordance with practice recommended in the Chlorine Manual published by the Chlorine Institute, Inc., New York. Use only in well ventilated areas.*

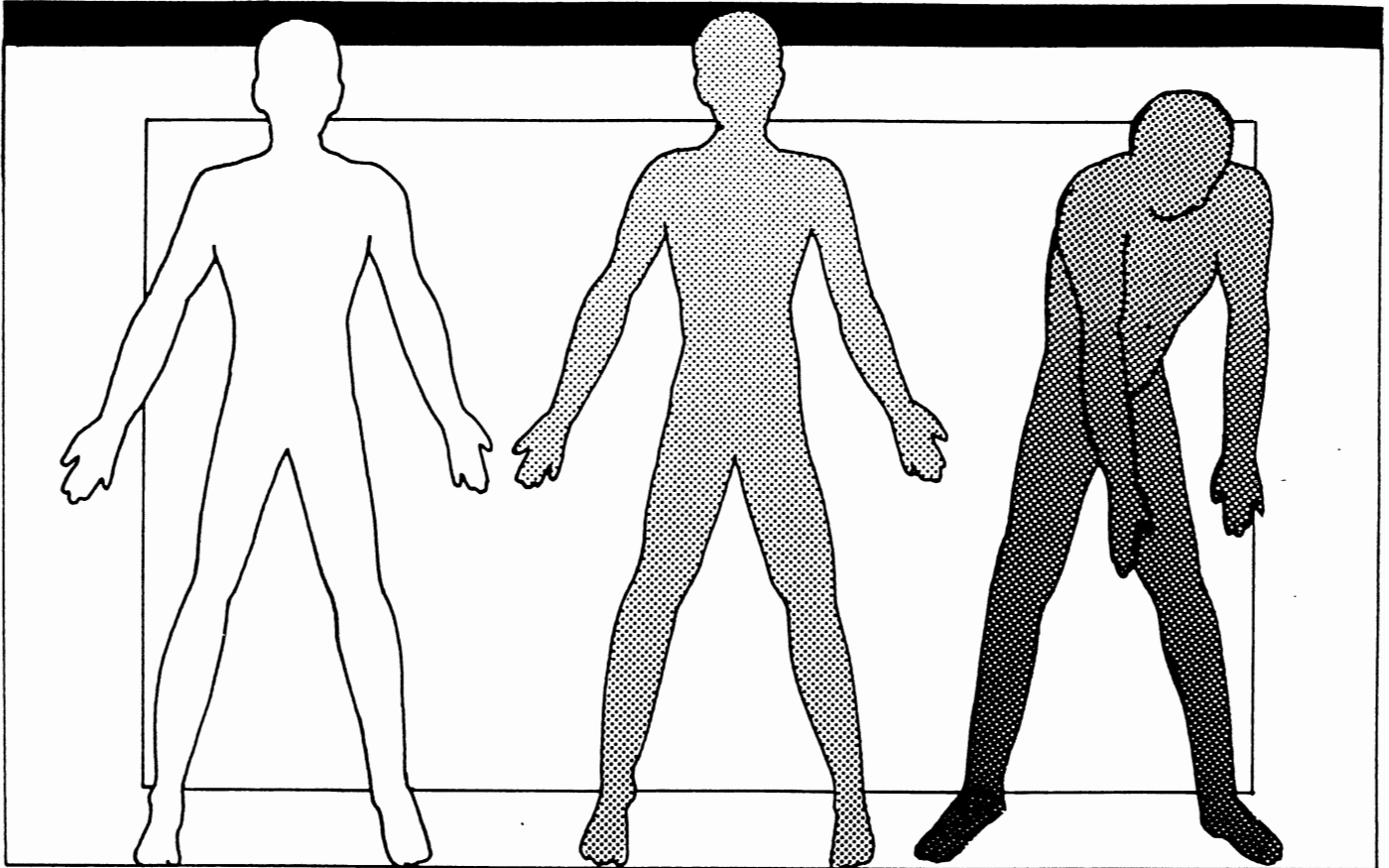
If this reference is applicable, you must have the Chlorine Manual and the

referenced gas masks in your possession and follow the recommendations in the manual.

You are responsible for determining whether the regulation, bulletin, or other document referred to on the pesticide product label applies to your situation and your intended use of the pesticide product. If the document is applicable, you must comply with all the specific directions for use and other requirements that it contains. These documents do not always accompany the pesticide product when it is sold. Instead, you may have to get the additional directions and requirements from other sources, such as pesticide dealers or company representatives, industry or commodity organizations, land-grant universities, or Cooperative Extension agents.

One sentence or paragraph on a pesticide label may be the only notice you will receive that additional use directions are required in order for the product to be used in compliance with its labeling. You must: 1) determine whether you are affected; 2) locate the applicable directions for use; 3) determine how to comply with the instructions and requirements in the directions for use; 4) comply with those instructions and requirements.

Harmful Effects and Emergency Response



Section 3, Harmful Effects And Emergency Response

Most pesticides are designed to harm or kill pests. Because some pests have systems similar to the human system, some pesticides also can harm or kill humans. Fortunately, humans usually can avoid harmful effects by avoiding being exposed to pesticides.

Humans may be harmed by pesticides in two ways: they may be poisoned or injured. Pesticide poisoning is caused by pesticides that harm internal organs or other systems inside the body. Pesticide-related injuries usually are caused by pesticides that are external irritants.

Pesticides that are chemically similar to one another cause the same type of harmful effects to humans. These effects may be mild or severe, depending on the pesticide involved and the amount of overexposure. Different groups of chemicals cause different types of effects. Individual chemicals within the same group often cause similar effects. Some pesticide chemical families can cause both external irritation injuries and internal poisoning illnesses.

Some pesticides are highly toxic to humans; only a few drops in the mouth or on the skin can cause extremely harmful effects. Other pesticides are less toxic, but too much exposure to them will cause harmful effects, also. A good equation to remember is: Hazard = Toxicity x Exposure.

Hazard is the risk of harmful effects from pesticides. Hazard depends on both the toxicity of the pesticide and the exposure you will receive in any situation.

A. Exposure

When a pesticide comes into contact with

a surface or an organism, that contact is called a pesticide exposure. For humans, a pesticide exposure means getting pesticides in or on the body. The toxic effect of a pesticide exposure depends on how much pesticide is involved and how long it remains there.

B. Avoiding Exposure

Avoiding and reducing exposures to pesticides will reduce the harmful effects from pesticides. You can avoid exposures by using safety systems, such as closed systems and enclosed cabs, and you can reduce exposures by wearing appropriate personal protective equipment, washing exposed areas often, and keeping your personal protective equipment clean and in good operating condition.

In most pesticide handling situations, the skin is the part of the body that is most likely to receive exposure. Evidence indicates that about 97 percent of all body exposure that happens during pesticide spraying is by contact with the skin. The only time that inhalation is a greater hazard than skin contact is when you are working in a poorly ventilated, enclosed space and are using a fumigant or other pesticide that is highly toxic by the inhalation route.

C. Causes Of Exposure

One of the best ways to avoid pesticide exposures is to avoid situations and practices where exposures commonly occur.

Inhalation exposures often are caused by:

- 1) prolonged contact with pesticides in closed or poorly ventilated spaces;
- 2) breathing vapors from fumigants and other toxic pesticides;
- 3) breathing vapors, dust, or mist while handling pesticides without appropriate protective equipment;
- 4) inhaling vapors present immediately after a pesticide is applied; for example, from drift

or from reentering that area too soon; 5) using a respirator that fits poorly or using an old or inadequate filter, cartridge, or canister.

D. Toxicity

Toxicity is a measure of the ability of a pesticide to cause harmful effects.

Some people react more severely or more mildly than estimated. Be alert to your body's reaction to the pesticides you are handling. Some people seem to be especially sensitive to individual pesticides or to groups of similar pesticides.

E. Harmful Effects

Pesticides can cause three types of harmful effects: acute effects, delayed effects, and allergic effects.

1) Acute effects are illnesses or injuries that may appear immediately after exposure to a pesticide (usually within 24 hours).

Acute effects usually are obvious and often are reversible if appropriate medical care is given promptly.

Pesticides cause four types of acute effects: 1) acute oral effects, 2) acute inhalation effects, 3) acute dermal effects, 4) acute eye effects.

2) ACUTE ORAL EFFECTS

Your mouth, throat, and stomach can be burned severely by some pesticides. Other pesticides that you swallow will not burn your digestive system, but will be absorbed and carried in your blood throughout your body and may cause you harm in various ways.

3) ACUTE INHALATION EFFECTS

Your entire respiratory system can be

burned by some pesticides, making it difficult to breathe. Other pesticides that you inhale may not harm your respiratory system, but are carried quickly in your blood throughout your whole body where they can harm you in various ways.

4) ACUTE DERMAL AND SKIN IRRITATION EFFECTS

Contact with some pesticides will harm your skin. These pesticides may cause your skin to itch, blister, crack or change color. Other pesticides can pass through your skin and eyes and get into your body, these pesticides are carried throughout your system where they can cause you harm in various ways.

5) ACUTE EYE EFFECTS

Some pesticides that get into your eyes can cause temporary or permanent blindness or severe irritation. Other pesticides may not irritate your eyes, but pass through your eyes and into your body. These pesticides can travel throughout your body, causing you harm in various ways.

F. Delayed Effects

Delayed effects are illnesses or injuries that do not appear immediately (within 24 hours) after exposure to a pesticide or combination of pesticides.

Delayed effects may be caused by: 1) repeated exposures to a pesticide, a pesticide group, or a combination of pesticides over a long period; of time; or, 2) a single exposure to a pesticide that causes a harmful reaction that does not become apparent until much later.

Some pesticides cause delayed effects only with repeated exposure over a period of days, months, or even years.

G. Signs And Symptoms Of Harmful Effects

Watch for two kinds of clues to pesticide-related illness or injury. Some clues are feelings that only the person who has been poisoned can notice, such as nausea or headache. These are symptoms. Other clues, like vomiting or fainting, can be noticed by someone else. These are signs you should know: 1) what your own symptoms might mean, and 2) what signs of poisoning to look for in your coworkers and others who may have been exposed.

H. Be Informed

You should know the kinds of harmful effects most likely to be caused by the pesticides you use.

I. Responding To A Poisoning Emergency

Get medical advice quickly if you or any of your fellow workers have unusual or unexplained symptoms starting at work or later the same day. Do not let yourself or anyone else get dangerously sick before calling your physician or going to a hospital. It is better to be too cautious than too late. Take the pesticide container (or the labeling) to the physician. Do not carry the pesticide container in the passenger space of a car or truck.

J. First Aid For Pesticide Poisoning

The best first aid in pesticide emergencies is to stop the source of pesticide exposure as quickly as possible. First aid is the initial effort to help a victim while medical help is on the way. Do not become exposed to the pesticide yourself while you are trying to help.

In an emergency, look at the pesticide labeling, if possible. If it gives specific first aid instructions, follow the instructions

carefully. Also, the **Material Safety Data Sheets (MSDS)** will provide important information about chlorine gas including emergency and exposure information.

K. Chlorine Gas - General Information

Chlorine is a chemical element that is a gas at room temperature and atmospheric pressure. In low concentrations, gaseous chlorine is almost colorless. In heavier concentrations, it has a greenish yellow color. Chlorine will liquefy under pressure and is packaged as a liquified gas. Chlorine is not flammable, but will support combustion and does react readily with hydrocarbons, alcohols, ethers, petroleum products and some refined metals. It will react with and burn its steel containers at temperatures above 450 degrees Fahrenheit, making exposure to fire conditions one of chlorine's worst possible hazards.

Chlorine is considered a hazardous material and should only be handled by specially trained personnel who are familiar with accepted practices for its safe use and who have the proper equipment for both normal handling as well as for emergency situations.

Chlorine gas is approximately 2.5 times heavier than air. Liquid chlorine is approximately 1.5 times heavier than water. When chlorine is under pressure in an enclosed container, some of it will be on the bottom in a compressed liquid state, and some will be on top in a gaseous form. The ratio of gas to liquid in the container is determined by the temperature of the chlorine. **Liquid chlorine is approximately 457 times greater in actual chlorine volume than gas chlorine when not confined.** Therefore the difference in a small gas leak and a small liquid spill is extremely disproportionate. In the event of a chlorine gas container leak, the cylinder should be positioned so that only gas escapes from

the leak area.

When chlorine gas is discharged from a cylinder, the cylinder will experience a loss in temperature and, as a result, will chill. This chilling effect will also slow the discharge rate. The cooler the cylinder the slower the rate of chlorine discharge. In the event of a gas leak, promoting this chilling effect will slow the discharge rate of the leak.

L. Chlorine Gas - MSDS Sheets

(See example at the end of this section)

The "ACUTE TOXICITY" section of the MSDS indicates that the primary route of exposure for chlorine gas is through inhalation. It states "Inhalation: Major potential route of exposure. Chlorine is a respiratory irritant. Concentrations of 3-6 ppm in the air can cause irritation of the nose and mucus membranes of the upper respiratory tract followed by headache and coughing. 10 ppm can cause severe irritation of the respiratory tract with 15-20 ppm causing intense cough. Other symptoms of overexposure can include nausea, vomiting, dizziness, shortness of breath and chest pain. Pulmonary edema and chemical pneumonia can develop and may occur hours after exposure...." The MSDS also indicates the possible symptoms for the secondary routes of exposure.

"Skin: Liquid contact can cause local irritation and burns. Chlorine vapors can cause irritation, burning and blisters."

"Eyes: Liquid contact can cause irritation and burns. Vapor concentrations of 1 ppm can cause redness, tearing and irritation of eyes"

"Ingestion: Chlorine is a gas at room temperature. Ingested liquid chlorine can cause severe burns of mouth, esophagus and stomach and nausea, pain and vomiting are likely to occur."

The MSDS also provides information for "FIRST AID" of chlorine exposure occurs. This information is important not only to the applicator, but provides necessary information to the doctor for treatment.

"Inhalation: Remove from contaminated area. If breathing has ceased, start artificial respiration at once. See a physician. Keep patient warm, at rest and comfortable."

"Skin: Remove contaminated clothing under shower, flush with water for at least 15 minutes, use no oil or chemical neutralizers."

"Eyes: Immediately flush with water at least 15 minutes. See physician promptly."

"Ingestion: See a physician. Give small amounts of ice."

The above information is very important. You will need to refer to the MSDS for the specific chlorine gas product that you use.

M. General Emergency Response Procedures For Chlorine Gas Leaks

- 1) Secure the equipment if possible.
- 2) Evacuate the area.
- 3) Contact emergency personnel.

MATERIAL SAFETY DATA SHEET(MSDS) EXAMPLE

I - IDENTIFICATION		
CHEMICAL NAME Chlorine	CHEMICAL FORMULA Cl ₂	MOLECULAR WEIGHT 70.90
TRADE NAME: Chlorine		
SYNONYMS: Chlorine		DOT I.D. NO.: UN 1017

II - PRODUCT AND COMPONENT DATA			
COMPONENT(S) CHEMICAL NAME	CAS. REGISTRY NO.	%(APPROX)	ACGIH TLV-TW
Chlorine	7782-50-5	100	1.0 ppm

III - PHYSICAL DATA	
APPEARANCE AND ODOR: Greenish-yellow gas, amber liquid; pungent odor	SPECIFIC GRAVITY: Liquid = 1.467 @ 0° C
BOILING POINT: -29.3° F	VAPOR DENSITY: 2.5
VAPOR PRESSURE: 71 psig @ 60°	% VOLATILE BY VOLUME: 100
EVAPORATION RATE: Not applicable	SOLUBILITY IN WATER: SLIGHT

IV - REACTIVITY DATA	
STABILITY: Unstable	CONDITIONS TO AVOID: Dry chlorine is highly reactive with titanium and tin. Reacts with most metals at high temperatures. Reacts with water to produce hydrochloric and hydrochlorous acids, which are corrosive to most metals.
INCOMPATIBILITY (MATERIALS TO AVOID): Ammonia, elemental metals, certain metal hydrides, carbides nitrides, oxides phosphides and sulfides, easily oxidized materials, organic materials and unstable and reactive compounds.	
HAZARDOUS DECOMPOSITION PRODUCTS: Chlorine is one of the chemical elements that cannot decompose.	
HAZARDOUS POLYMERIZATION: Will not occur.	

V - PERSONAL PROTECTION AND CONTROLS

RESPIRATORY PROTECTION - Minimum respiratory protection requirements:

1-10 ppm: Half-mask respirator with acid gas cartridge.
10-25 ppm: Full-face respirator with acid gas canister.
25 ppm and greater: pressure demand self-contained breathing apparatus or pressure demand air-line respirator with escape provision. follow any applicable respirator use standards and regulations. NIOSH/MSHA approved respirator should be used.

VENTILATION:

As necessary to maintain vapor concentrations below 1 ppm, at all times.

SKIN PROTECTION:

Wear gloves during normal operations.

EYE PROTECTION:

Chemical goggles should be worn when operating valves and connecting or disconnecting chlorine lines.

HYGIENE:

Avoid contact with skin and avoid breathing vapors. Do not eat, drink, or smoke in work area. Wash hands prior to eating, drinking, or using restroom.

OTHER CONTROL MEASURES:

To determine the exposure level(s), monitoring should be performed regularly. Wear respirator while operating valves and connecting or disconnecting lines. Safety shower and eye wash fountain should be available. Test unloading line connections for leaks by checking with ammonia vapor.

VI - FIRE AND EXPLOSION INFORMATION

FLASH POINT(Method used):

None

FLAMMABLE LIMITS IN AIR:

Non-flammable but does support combustion.

EXTINGUISHING AGENTS:

None. Apply water to keep containers cool. Do not apply water to leaking containers, refer to Reactivity Section.

UNUSUAL FIRE AND EXPLOSION NOTES: Many metals ignite in the presence of chlorine, i.e., steel at about 485°F. Remove chlorine containers from fire zone if possible. Firefighters should wear self-contained, positive-pressure breathing apparatus, and a one piece total-encapsulating suit of butyl coated nylon or equivalent.

VII - TOXICITY AND FIRST AID

EXPOSURE LIMITS:

ACGTH: 1 ppm (8 hr) TWA, 3 ppm STEL OSHA: 1 ppm Ceiling
(Odor threshold approximately .3 ppm - highly variable especially with individuals routinely exposed)

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Asthma, bronchitis, emphysema and other lung diseases, and chronic nose, sinus or throat conditions.

ACUTE TOXICITY:

Inhalation: Major potential route of exposure. Chlorine is a respiratory irritant. Concentrations of 3-6 ppm can cause irritation of the nose and mucous membrane of the upper respiratory tract followed by headache and coughing. 10 ppm can cause severe irritation of respiratory tract with 15-20 ppm causing intense cough. Other symptoms of overexposure can include nausea, vomiting, dizziness, shortness of breath and chest pain. Pulmonary edema and chemical pneumonia can develop and may occur hours after exposure. Prolonged exposures to concentrations above 25 ppm can cause unconsciousness and death. One study which involved exposures to humans to .5 ppm for 8 hours caused transient decreased pulmonary capacity, as measured by pulmonary function tests.

Skin: Liquid contact can cause local irritation and burns. Chlorine vapors can cause irritation, burning and blisters.

Eyes: Liquid contact can cause irritation and burns. Vapor concentrations of 1 ppm can cause redness, tearing and irritation of eyes.

Ingestion: Chlorine is gas at room temperature. Ingested liquid chlorine can cause severe burns of mouth, esophagus and stomach and nausea, pain and vomiting are likely to occur.

FIRST AID:

Inhalation: Remove from contaminated area. If breathing has ceased, start artificial respiration at once. See a physician. Keep patient warm, at rest and comfortable.

Skin: Remove contaminated clothing under shower, flush with water for at least 15 minutes, use no oil or chemical neutralizers.

Eyes: Immediately flush with water at least 15 minutes. See a physician promptly.

Ingestion: See a physician. Give small amounts of water or ice.

VIII - STORAGE AND HANDLING PRECAUTIONS

Do not attempt to handle, store, or use without complete review of the Chlorine Institute's Chlorine Manual.

Store properly labeled containers in a cool, dry, well-ventilated area and away from basements, pits, etc. Room vents should be located at floor level. Vapors are heavier than air and will collect in low areas.

Do not remove or deface label or tag.

Do not apply heat to chlorine containers.

Do not apply pressure to chlorine ton cylinders.

Chlorine piping and equipment must be thoroughly cleaned of organics and be moisture free before use.

Keep chlorine piping and handling equipment clean and dry. Liquid chlorine lines must have suitable expansion chambers between block valves due to the high coefficient of expansion.

IX - SPILL, LEAK AND DISPOSAL PRACTICES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

For liquid spills wear one-piece totally encapsulating suit of butyl coated nylon or equivalent with self-contained breathing apparatus. For gas leaks rainjacket and pants with self-contained breathing apparatus should be worn.

WASTE DISPOSAL METHOD:

Chlorine gas will disperse to the atmosphere leaving no residue. Chlorine may be neutralized by introducing it into caustic soda, soda ash, or hydrated lime solutions. Do not apply caustic soda, soda or hydrated lime directly onto liquid chlorine spill. Liquid and/or solid residues from neutralization must be disposed of in a permitted waste management facility. Consult federal, state, or local disposal authorities for approved procedures.

X - TRANSPORTATION

DOT HAZARD CLASSIFICATION:

Non-flammable gas; Poison

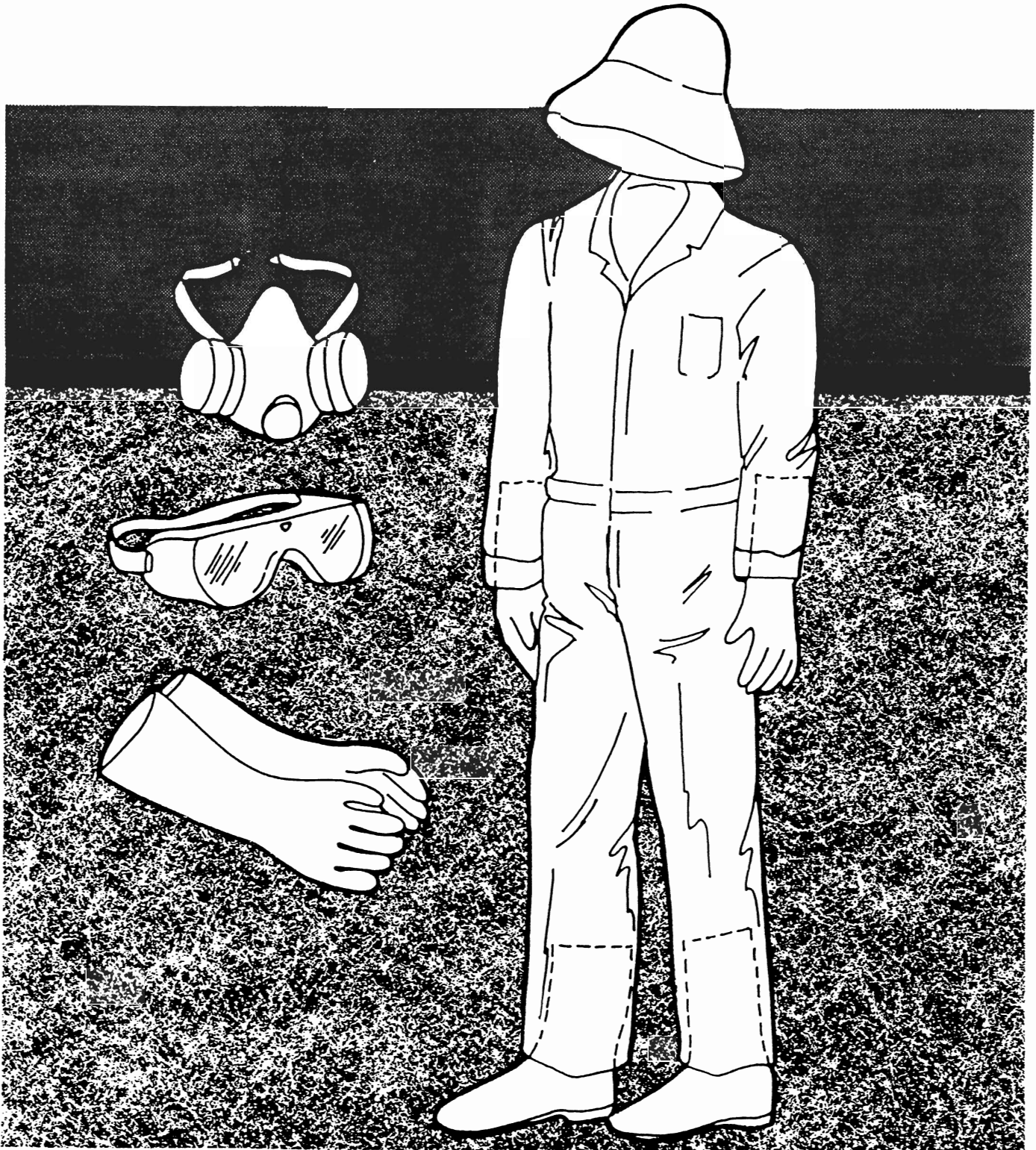
PLACARD REQUIRED:

Chlorine

LABEL REQUIRED:

Non-flammable Gas and Poison or Chlorine(optional). Label as required by OSHA Hazard Communication Standard, and any applicable state and local regulations.

Personal Protective Equipment



SECTION 4, PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) is clothing and devices that are worn to protect the human body from contact with pesticides or pesticide residues. Personal protective equipment includes such items as coveralls or protective suits, footwear, gloves, aprons, respirators, eyewear, and headgear.

Ordinary shirts, pants, shoes and other regular work clothing usually are not considered personal protective equipment, although the pesticide labeling may require you to wear specific items of work clothing during some activities.

Exposure to pesticides can cause harmful effects. To prevent or reduce exposure to pesticides, you may need to wear personal protective equipment. You are legally required to follow all personal protective equipment instructions that appear on the label or in labeling.

Remember, the lack of any requirement for personal protective equipment or the mention of only one piece of equipment does not rule out the need for more protection.

Pesticide labeling lists the minimum personal protective equipment you must wear while handling the pesticide. The MSDS Sheets for the chlorine gas product that you use will provide more information related to other personal protective equipment you may want to use.

A. MSDSs and PPE

In the MSDS example under section "VII - PERSONAL PROTECTION AND CONTROLS" you will find a listing of the personal protective equipment recommendations and recommendations for other areas of safety.

"RESPIRATORY PROTECTION...Minimum Respiratory Protection Requirements:

1-10 ppm: Half-mask respirator with acid gas cartridge.

10-25 ppm: Full face respirator with acid gas canister.

25 ppm and greater: Pressure demand self-contained breathing apparatus or pressure demand air-line respirator with escape provision. Follow any applicable respirator use standards and regulations. NIOSH/MSHA approved respirator should be used."

"VENTILATION...As necessary to maintain vapor concentrations below 1 ppm, at all times."

"SKIN PROTECTION...Wear gloves during normal operations."

"EYE PROTECTION...Chemical goggles should be worn when operating valves and connecting or disconnecting chlorine lines."

HYGIENE...Avoid contact with skin and avoid breathing vapors. Do not eat, drink, or smoke in work area. Wash hands prior to eating, drinking, or using restroom."

"OTHER CONTROL MEASURES...To determine the exposure level(s), monitoring should be performed regularly. Wear respirator while operating valves and connecting or disconnecting lines. Safety shower and eye wash fountain should be available. Test unloading lines for leaks by checking with ammonia vapor."

As with all labeling, check the MSDS for the specific chlorine gas product you use for protection information.

B. Chemical-Resistant Personal Protective Equipment

Some pesticide labeling requires you to

wear chemical-resistant personal protective equipment. You must select a material that will be resistant for the period of time that you will be exposed to the pesticide. Most chemical-resistant personal protective equipment items are made of plastic or rubber, but these materials are not equally resistant to all pesticides and in all circumstances.

C. Factors Affecting Chemical Resistance

How chemical-resistant a material will be in your pesticide handling situation depends on the length of exposure, the exposure situation, and the chemical to which the material is exposed.

D. Length Of Exposure

Not all types of material that are resistant to a particular pesticide will protect you for the same amount of time. Some materials will keep the pesticide out for a fairly long time. Others will allow the pesticide to go through the material to your skin fairly quickly.

E. Exposure Situation

Even a chemical-resistant material will not continue to protect you if it becomes damaged during the pesticide handling task.

F. Choosing Chemical-Resistant Materials

Always read the pesticide labeling to see if it tells you what materials are resistant to the pesticide product. If it does not, look for another source of help in making a selection.

G. Chemical-Resistant Suits And Hoods

The best choice of materials for chemical-

resistant suits and hoods is generally: 1) rubber or plastic, such as butyl, neoprene, or polyvinyl chloride (PVC); or 2) nonwoven fabric coated with plastic or another barrier material.

Read the packaging for the suits carefully to be sure that they are "chemical resistant", "chemical protective", or "liquidproof".

H. Protecting Your Skin

The skin is the part of your body that usually gets the most exposure while you are handling pesticides. Pay particular attention to covering as much of your skin as possible. Remember that personal protective equipment protects you only if the pesticide remains on the outside of the material. Once the pesticide gets on the inside and next to your skin, the material works against you. It holds the pesticide tightly next to your skin for as long as it is worn. When this happens, more pesticide will get on your skin and may cause irritation or go through your skin and into your body.

I. Body Protection

Any time you handle pesticides, wear at least a long-sleeved shirt and long-legged pants. In many instances the pesticide labeling will require you to wear a coverall, a chemical-resistant suit, or a chemical-resistant apron.

J. Long-Sleeved Shirt And Long-Legged Pants

The long-sleeved shirt and long-legged pants you wear should be made of sturdy material. Fasten the shirt collar completely to protect the lower part of your neck.

K. Coveralls

Coveralls you wear should be made of sturdy material such as cotton, polyester, a cotton-synthetic blend, denim, or a nonwoven fabric. One-piece coveralls look like jump suits or flight suits. Two-piece coveralls look like surgeon's suits. When wearing a coverall, close the opening securely so the entire body except the feet, hands, neck, and head are covered. If you wear a two-piece coverall, do not tuck it in at the waist; the shirt should extend well below the waist of the pants and fit loosely around the hips.

L. Chemical-Resistant Suit

Some pesticide labeling requires handlers to wear a chemical-resistant suit. This usually indicates that the pesticide is very hazardous, either for acute effects or for delayed effects, and that extra precaution is necessary to prevent the pesticide from getting on you.

If you expect to be in a situation where a large amount of pesticide could be deposited on your clothing, and if you will be in that situation for a long time, consider wearing a chemical-resistant suit even if the pesticide labeling does not require you to do so.

M. Hand And Foot Protection

Pesticide handlers get by far the most pesticide exposure on their hands and forearms. As a result, most pesticide labeling will require you wear chemical-resistant gloves at all times while handling the pesticide. Wear chemical-resistant gloves any time you may get pesticides on your hands.

Pesticide handlers also often get pesticides on their feet. Sturdy shoes and socks are sufficient to protect your feet during a few pesticide handling activities. Canvas, cloth, and leather are difficult or impossible

to clean adequately, however. Consider using chemical-resistant materials when pesticides or pesticide residues, especially concentrates, may get on your footwear.

One situation where you should not wear chemical-resistant gloves and footwear is during the handling of a few fumigants, such as methyl bromide, because the gloves and footwear can trap the gas near the skin and cause burns. The labeling on these fumigants will instruct you not to wear chemical-resistant gloves and footwear or other chemical-resistant clothing.

N. Protecting Your Eyes

When the pesticide labeling requires you to wear protective eyewear, wear goggles, a face shield, or safety glasses with shields at both the brow and sides. Eyes are very sensitive to the chemicals in some pesticide formulations, especially concentrates, and temporary blindness caused by an accident may delay or prevent self-treatment. Eyes also readily absorb some pesticides.

Shielded safety glasses or full-face shields are a good choice in many handling situations because they are comfortable, do not cause fogging or sweating, and give good eye protection for many exposure situations. Face shields that are cupped inward towards your throat give better protection from splashes than a straight face shield. However, if you will be in an open cab during an airblast application, flagging directly under an aerial application, applying mists, fogs, or aerosols indoors, or in any other situation where you will be enveloped in a spray, mist, or dust, wear goggles that fit tightly against your face.

Either goggles or shielded safety glasses can be worn with a half-face respirator. Full-face respirators are supplied with their own face shield, so additional eye protection is not required.

O. Protecting Your Respiratory Tract

The respiratory tract-the lungs and other parts of the breathing system-is much more absorbent than the skin. You must wear a respirator when the pesticide labeling directs you to do so. Even if the labeling does not require it, you should consider wearing a respiratory protective device: 1) if you are in an enclosed area and the pesticide you are handling has a labeling precautionary statement such as "do not breathe vapors or spray mist," or "harmful or fatal if inhaled," 2) if you will be exposed for a long time to pesticides that are in or near your breathing zone.

Some fumigants and a few other pesticide formulations contain an additive that will warn you if you begin to inhale the pesticide.

Some pesticide labeling lists the type of respirator you should wear when handling the product. Other labeling requires the use of a respirator, but does not specify the type or model to be used. When the pesticide labeling requires you to use a respirator, you must wear one that is approved by NIOSH or the MSHA. If the respirator has more than one part, all the parts must be approved.

Studies have shown that many pesticide handlers do not use respirators correctly and so are not being well protected. Before you use a respirator, you should be trained in the correct procedures for selecting, fitting, cleaning and sanitizing, inspecting, and maintaining respiratory protective equipment. There are two basic types of respirators: 1) air-supplying respirators which supply you with clean, uncontaminated air from an independent source, 2) air-purifying respirators which remove contaminants from the air around you.

P. Air-Supplying Respirators

Air-supplying respirators are used in a few specialized situations where other types of respirators are not protective enough. Use an air-supplying respirator when the pesticide labeling tells you to. In addition, you should use one when handling pesticides: 1) when the oxygen supply is low, 2) during fumigation in enclosed areas, such as greenhouses or other buildings, railcars, shop holds, or grain bins.

Q. Supplied-Air Respirators

These respirators pump clean air through a hose to the face mask. You are limited to working within the distance the hose can reach from the supply of clean air.

R. Self-Contained Breathing Apparatus

This type of respirator supplies clean air from cylinders that you carry with you, usually on your back. This lets you move more freely and over a wider area than you can with a supplied-air respirator. Get training from competent instructors before using self-contained breathing equipment. These devices contain a limited air supply (usually about 30 to 45 minutes) which may be used up even more quickly in high temperatures or with excessive exertion.

S. Air-Purifying Respirators

In most situations where pesticide handlers need to use a respirator, some type of air-purifying respirator would usually provide enough protection. However, air-purifying respirators will not protect you from fumigants, from extremely high concentrations of vapor, or when the oxygen supply is low.

T. Functions Of Air-Purifying Respirators

Air-purifying respirators remove contaminants from the air in two ways: 1) by filtering dusts, mists, and particles; and, 2) by removing gases and vapors.

Sometimes you will need only a respirator that filters dusts and mists from the air; at other times you will need one that removes gases and vapors as well.

Wear a dust/mist-filtering respirator if the pesticide labeling tells you to or if you will be exposed to pesticide dusts, powders, mists, or sprays in your breathing zone. Wear a respirator that also removes vapors if the pesticide labeling tells you to or if you will be exposed to gases or vapors in your breathing zone.

U. Styles Of Air-Purifying Respirators

Air-purifying respirators are of three basic styles: 1) dust/mist masks, which usually are shaped filters that cover the nose and mouth to filter out dusts, mists, and particles; 2) devices consisting of a body and one or more cartridges that contain air-purifying materials; 3) devices consisting of a body and a canister that contains air-purifying materials.

Cartridges may contain either dust/mist-filtering material or vapor-removing material. For pesticide handling tasks where vapor removal is needed, a prefilter must be used with the vapor-removing cartridge. The prefilter removes dusts, mists, and other particles before the air passes through the vapor-removing cartridge. A few vapor-removing cartridges have an attached prefilter, but most are sold separately. Separate prefilters are preferred for use with pesticides because they often need to be replaced before the vapor-removing cartridge is used up.

Some cartridge-type respirators are one piece units with cartridges permanently attached to the facepiece. After use, the entire unit is discarded. Other cartridge respirators are two-piece units with removable cartridges and a body that can be cleaned and reused. The dust/mist filtering or vapor-removing cartridges and the prefilters can be replaced when they lose their effectiveness.

A canister contains both dust/mist-filtering and vapor-removing material. Canisters contain more air-purifying material than cartridges. They last much longer and may protect you better in situations where the concentration of gas or vapor in the air is high. They are also much heavier and more uncomfortable to wear.

Canister-type respirators are often called gas masks. They usually have the canister connected directly to the facepiece or worn on a belt and connected to the facepiece by a flexible hose. The body is designed to be cleaned and reused. The canisters can be replaced when necessary.

V. Selecting And Using Vapor-Removing Devices

Vapor-removing devices are rated by NIOSH for the types of gases and vapors they will remove. For pesticide handling tasks where vapor protection is needed, NIOSH requires that an organic-vapor-removing material and a pesticide prefilter be used.

When you wear a vapor removing respirator, remember that vapor-removing materials gradually lose their ability to hold more gases and vapors. Their useful life can vary greatly.

If you notice an odor, taste, irritation, or dizziness, that is a signal that you are no longer being protected. Some vapor-removing materials have a "service life indicator" to tell you when the material is

nearly used up.

W. Fitting Air-Purifying Respirators

Respirators fit wearers in one of two ways, Most must seal tightly to the face; others are loose-fitting.

Face sealing respirators must form a tight seal against your face to be effective. Otherwise, pesticides can leak around the edges.

Dust/mist masks are face-sealing respirators. They fit over your nose and mouth and have a clip that you press around the bridge of your nose to help form a seal. Most cartridge and canister respirators are also face-sealing respirators. Full-face styles form and keep a tight seal better than half-face styles.

Your face-sealing respirator should be tested before you wear it in a situation where you may inhale pesticides. There are two types of tests: fit tests and fit checks. Ensure that the respirator is operating correctly and that you are being protected.

Have a fit test before you use your cartridge or canister respirator the first time, and then be retested periodically. Get the fit test through a program approved by NIOSH and OSHA, the agencies that regulate respirator fit testing.

A fit check is an on-the-spot check that you should do to make sure the respirator is still working correctly. Do a fit check each time you wear a face-sealing respirator.

X. Personal Protective Equipment For Handling Fumigants

Fumigants are pesticides that are applied as a gas or that readily form a gas when they are applied. Their pesticidal action is in the gaseous form. Fumigants are very highly

toxic to plants and animals, including humans. Use extreme caution and wear appropriate personal protective equipment whenever you handle fumigants. Personal protective equipment requirements for protection from fumigants are often very different from the requirements for other types of pesticides. Follow label directions for each fumigant exactly.

Inhaling even small amounts of some fumigant gases can be fatal or cause severe injury. You must wear the respirator listed on the fumigant labeling. Wear it during any handling activity, including removing tarps or other coverings, when exposure to the gas is likely.

Never work alone with fumigants, especially in enclosed areas. Arrange to be monitored at all times by another handler who has immediate access to an appropriate respirator, in case rescue is needed.

While handling any fumigant indoors or in an enclosed area, use an air-supplying respirator. Cartridge and canister respirators will not protect you in these situations.

Some fumigants readily penetrate plastic, rubber, and leather. These fumigants may be trapped inside gloves boots, or tight-fitting coveralls and cause severe skin irritation or lead to poisoning through skin absorption. The labeling on these fumigants will tell you the appropriate personal protective equipment to wear while handling these pesticides. Such labeling will often tell you to wear loose-fitting cloths and "breathable" footwear such as canvas or other fabric. The labeling may tell you not to wear any gloves or to wear cotton or other absorbent gloves.

2. Disposables and Reusables

Personal protective equipment items either should be disposable or should be easy to clean and sturdy enough for repeated use.

A. Disposables

Disposable personal protective equipment items are not designed to be cleaned and reused. Discard them when they become contaminated with pesticides.

Dust/mist masks, prefilters, canisters, filtering and vapor-removing cartridges, and a few cartridge respirators are disposables. They cannot be cleaned, and should be replaced often.

B. Reusables

Some personal protective equipment that you buy may be designed to be cleaned and reused several times. However, do not make the mistake of reusing these items when they are no longer protecting you.

Rubber and plastic suits, gloves, boots, aprons, capes, and headgear often are designed to be cleaned and reused, but even these reusables should be replaced often. Wash them thoroughly between uses. Before you put them on, inspect reused items carefully for signs of wear or abrasion. If they show any sign of wear, throw them out.

Most protective eyewear and respirator bodies, facepieces and helmets are designed to be cleaned and reused. These items may last several years if they are maintained properly and are of good quality.

3. Maintaining Personal Protective Equipment

When you finish an activity where you are handling pesticides or are exposed to them, remove your personal protective equipment right away. Wash the outside of your gloves with detergent and water before you remove them. Consider washing the outside of other chemical-resistant items before you remove them also. This helps you avoid contacting the contaminated part of the items while you are removing them, and helps keep the inside surface uncontaminated. If any other clothes have pesticides on them, change them also. Determine whether the items should be disposed of or cleaned for reuse.

A. Washing Personal Protective Equipment

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.

B. Alert the persons who does the washing

Be sure that the people who clean and maintain your personal protective equipment and other work clothes know that they can be harmed by touching the pesticide that remains on the contaminated items. Tell them that they should: 1) wear gloves and an apron, especially if handling contaminated items regularly or handling items contaminated with highly toxic pesticides; 2) work in a well-ventilated area if possible, and avoid inhaling steam from the washer or dryer.

C. Maintaining Eyewear and Respirators

Wash goggles, face shields, shielded safety glasses, and respirator bodies and facepieces after each day of use. Use a detergent and hot water to wash them

thoroughly. Sanitize them by soaking for at least 2 minutes in a mixture of 2 tablespoons of chlorine bleach in a gallon of hot water. Rinse thoroughly to remove that detergent and bleach. If the bleach is a registered pesticide, make sure this use is consistent with the "Directions for Use". Dry thoroughly or hang them in a clean area to dry.

Pay particular attention to the headbands. Headbands made of absorbent materials should be replaced with chemical-resistant headbands. After each day of use, inspect all headbands for signs of wear or deterioration and replace as needed.

Store respirators and eyewear in an area where they are protected from dust, sunlight, extreme temperatures, excessive moisture, and pesticides or other chemicals.

A zip-closable sturdy plastic bag works well for storage.

Respirator maintenance is especially important. Inspect your respirator before each use. Repair or replace it whenever any part shows signs of wear or deterioration. Maintain an inventory of replacement parts for the respirators you own, and do not try to use makeshift substitutes, or incompatible brands. If you keep a respirator for standby or emergency use, inspect it at least monthly and before use.

If you remove your respirator between handling activities:

- * Wipe the respirator body and facepiece with a clean cloth.
- * Replace caps, if available, over cartridges, canisters, and prefilters.
- * Seal the entire respirator in a sturdy airtight container, such as a zip-closable bag. If you do not seal the respirator

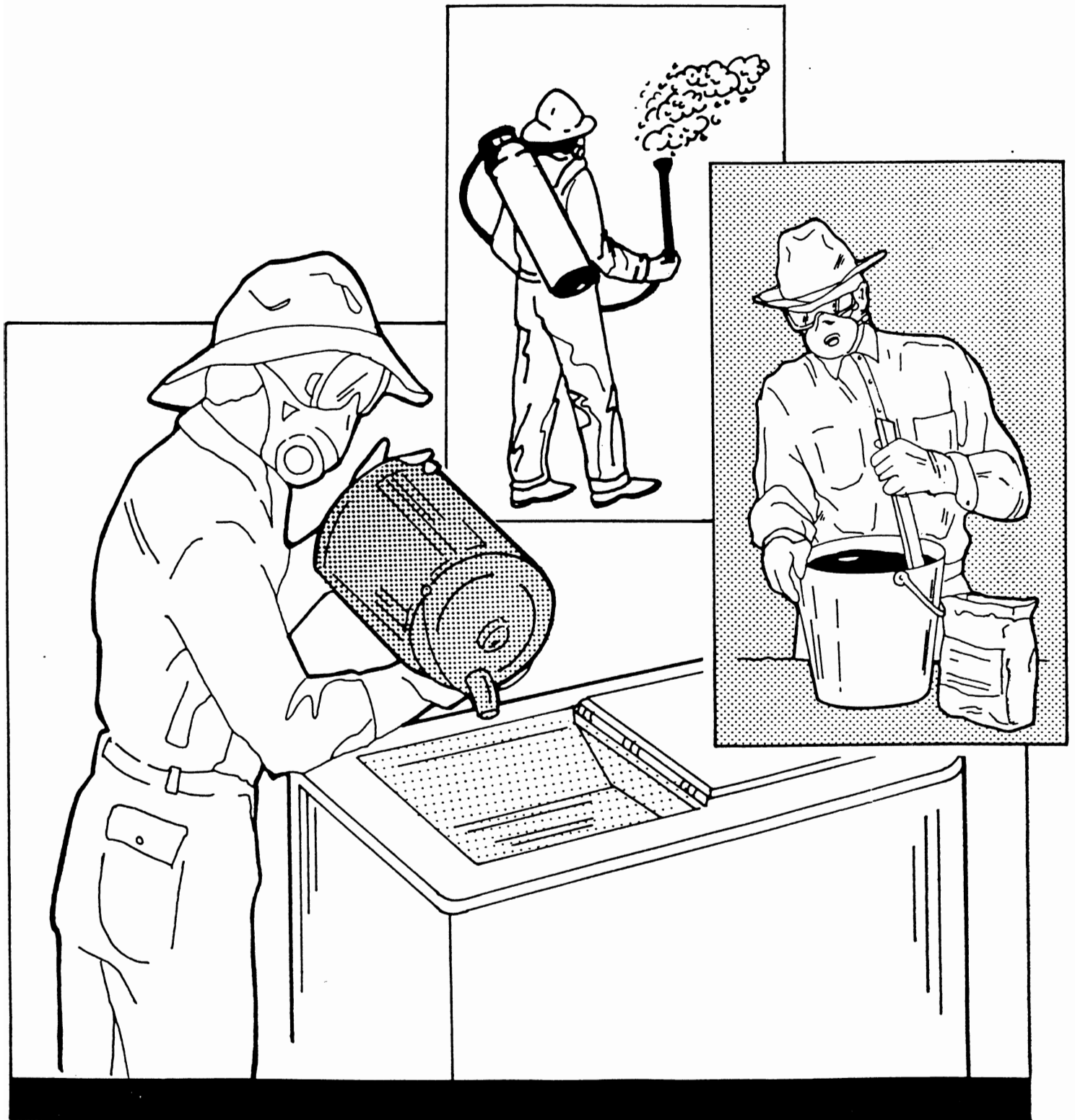
immediately after each use, the disposable parts will have to be replaced more often. Cartridges, canisters, prefilters, and filters will continue to collect impurities as long as they are exposed to the air.

At the end of any work day during which you wore a reusable respirator:

- * Remove the filter or prefilter. Most filters should be discarded. A few are designed to be washed and reused.
- * Take off cartridges or canisters. Discard them or, if still usable, replace their caps and seal them in an airtight container such as a zip-closable plastic bag.
- * Clean and store respirator as directed above.

Discard disposable respirators according to manufacturer's instructions. Do not try to clean them.

Mixing, Loading, and Application



SECTION 5, Mixing, Loading, And Application

Mixing, loading, and application are the primary pesticide handling tasks. They are also among the most hazardous aspects of a handler's job. Never try to cut corners where safety is concerned, and do not assume that every job will be like every other. For example, even though you are familiar with chlorine gas, take the time to read the labeling again each time you buy the product. Directions are changing more often than in the past, and important new information may have been added.

Safe Mixing and Loading Practices

Pesticide handlers are most often exposed to harmful amounts of pesticides when mixing or loading concentrated pesticides. Handlers who mix and load concentrated pesticides with high acute toxicity have an especially high risk of accidental poisoning. By observing some simple precautions, you can reduce the risks involved in this part of your job. This procedure would involve the connecting and disconnecting of the gas injection equipment.

A. Select an Appropriate Area

Choose the pesticide mixing and loading area carefully. It should be outdoors or in a well-ventilated area away from unprotected people, animals, food, other pesticides, and other items that might be contaminated. Choose a place with good light, especially if you are working at night. Be particularly careful not to mix or load pesticides indoors unless lighting and ventilation are adequate.

B. Personal Protective Equipment

Before opening a pesticide container, you

and those you supervise must put on the appropriate personal protective equipment. By law, you must use all of the personal protective equipment that the pesticide labeling requires for mixers and loaders. Consider using additional personal protective equipment in certain mixing and loading situations.

C. Face Protection

If you will be pouring liquid pesticide or adding dry pesticide to a liquid, consider wearing a face shield to keep splashes and wafting dusts off your face and out of your nose and mouth. A face shield is easy to put on, take off, and clean at the end of the day. If you need to wear a respirator, goggles or shielded safety glasses will fit better than a face shield.

D. Protection From Vapors

If you will be handling pesticides which produce vapors that cause your eyes, nose, or throat to sting or that cause you other discomfort, wear eye protection and a vapor-removing respirator with NIOSH/MSHA approval.

E. Spills

To prevent spills or leaks, close containers after each use. Even if you plan to mix more pesticide soon, close the container tightly each time. Never leave a tank unattended while it is being filled. It may overflow and contaminate the area.

If you splash or spill a pesticide on yourself while mixing or loading, stop right away and remove your contaminated clothing. Wash thoroughly with a mild liquid detergent (or soap) and water as quickly as possible. Put on clean personal protective equipment.

F. Empty Pesticide Containers

Even after it appears that all the pesticide

product has been removed from a container, it usually is not truly empty. The pesticide that clings to the inside of the container can be dangerous to you, other people, and the environment. Take care of empty containers at once. Follow directions for rinsing containers where applicable (triple rinse).

Return all pesticide containers to the pesticide storage area or the container holding area when you finish your task. Do not leave them unattended at the mixing, loading, or application site. Never give pesticide containers to children to play with or to adults to use.

Dispose of containers in accordance with label directions. This may involve the return or refilling of chlorine cylinders.

G. Applying Pesticides Safely

Every time you apply pesticides, you have two major responsibilities: 1) protecting yourself, others, and the environment, and 2) making sure that the pesticide is applied correctly.

Some of the general concerns related to the application of chlorine gas are as follows:

- * The immediate area around the pool should be cleared of people prior to the application of chlorine gas. Remember chlorine gas is 2.5 times heavier than air. If chlorine gas is not taken up by the water it may concentrate at ground level for a period of time.
- * Always leave two to four pounds of chlorine in each cylinder to prevent cylinder contamination, such as water suck-back.
- * Chlorine is readily absorbed into water through the process of diffusion when properly dispensed. It is mandatory that the flow rate of injection never cause

chlorine to break the surface of the water.

- * In the event of an emergency, the applicator must have respiratory protective equipment readily available when dispensing chlorine gas.

H. MSDSs - Spill, Leak and Disposal

The MSDS example lists *"STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED...For liquid spills wear one-piece totally encapsulating suit of butyl coated nylon or equivalent with self-contained breathing apparatus. For gas leaks rainjacket and pants with self-contained breathing apparatus should be worn."*

When attempting to find a chlorine leak **never spray water onto the suspected leak area. Use ammonia fumes only to check for leaks and never spray liquid ammonia onto a suspected leak area.**

I. Personal Protective Equipment

By law, you must wear the personal protective equipment and other clothing that the pesticide labeling requires for applicators. Consider using additional protection for some types of pesticide application tasks. You may need to weigh several factors before you can make good decisions about the personal protective equipment you should wear.

J. Hand-Carried Application Equipment

When you carry the application equipment, such as hand-held sprayers or shake cans, you risk being directly exposed to the pesticide. A dripping or partially clogged nozzle, an unfastened cap, a leaky hose, or a loose connection are extremely likely to cause exposure. Consider wearing extra

personal protective equipment to protect the area of your body that is in contact with the equipment.

If you carry only the nozzle, consider wearing arm-covering gloves or elbow-length gloves with the cuffs taped or otherwise sealed to the coverall sleeve.

K. Adjusting Pesticide-Coated Equipment

You may need to wear a protective apron while doing some types of equipment adjustments and repairs. Consider wearing a vapor-removing respirator, even outdoors, if you must adjust fumigation equipment.

Application Procedures

Every time you apply a pesticide, follow these basic procedures to make sure that you are using the pesticide safely and effectively:

(1) Deliver The Pesticide To The Target

Take the time to be sure that the pesticide is reaching the surface or space to which you are directing it. Pesticide that is deposited elsewhere is a waste of time and money and may harm the nontarget areas.

(2) Check The Delivery Rate

Check to be sure that you are applying the pesticide evenly and in approximately the right amounts. No puddles of liquid pesticide, mounds of dry pesticide, or escape of gas should be seen in the application area.

(3) Avoid Nontarget Organisms

Before you apply a pesticide, clear all unprotected people from the area. It is

illegal to allow them to be exposed to a pesticide application—either directly or through drift. Also remove any pets or livestock that are not being treated with the pesticide. Even when the pesticide application is a narrowly directed one, keep people and animals out of the immediate area during the application.

Check the pesticide labeling to find out when people and nontarget animals can go back into the application area. The labeling of some pesticides restricts entry into treated areas for periods ranging from several hours to several days. Even if the pesticide labeling has no such instructions, do not allow anyone to enter the treated area at least until any dusts and mists have settled out of the air and any vapors have dispersed.

(4) Avoid Nontarget Surfaces

When possible, remove from the application site any items that should not be contaminated with pesticides. Cover or protect any items that cannot be removed from the area and that are not involved in the handling activity. Items that should be removed or covered include such things as food and food utensil; bedding; toys; seed; pet or livestock feed, water or supplies; and other items that could transfer pesticides to people, pets, or livestock.

(5) Operate Equipment Safely

Turn off your equipment whenever you pause for any reason. Take special care to turn it off before making any adjustments or repairs. Turn off the main pressure valve on the tank and release any pressure remaining at the nozzles.

Check hoses, valves, nozzles, hoppers, and other equipment parts occasionally while you are applying. If you notice a problem, stop right away and fix it. Do not use bare hands or your mouth to clear nozzles or hoses.

With complete control and careful operation, properly reconditioned valves on small chlorine gas cylinders should remain in good working order, free of leakage, for long periods of time. Regardless, all small cylinder valves should be reconditioned as necessary to prevent corrosion or leakage.

Small cylinders used for residential swimming pool chlorination which never leave the control of the applicator can be refilled without internal inspection and cleaning each trip. However, it is recommended that these cylinders be reconditioned at least annually and internally inspected every time the valve is replaced. Hydrostatic pressure testing is required every 5 years. It is recommended that records be maintained for inspection, reconditioning and hydrostatic testing of the small cylinders.

After Mixing, Loading, and Application

As soon as you finish mixing, loading, or applying a pesticide, you should do a few important followup tasks. Take the time to clean up properly. Wash your pesticide equipment and then wash yourself. Return equipment to its designated place and safely store or dispose of all pesticide materials and other chemicals that you have used. Be sure that your work site presents no hazards to people or to the environment. Never leave the site unattended until everything has been cleaned up and put away. While you can still remember the facts, make a record of what you have applied and the conditions at the application site.

(1) Equipment Cleaning

Always clean mixing, loading, and application equipment as soon as you finish using it- do not leave equipment with pesticides on or in it at the mixing and loading site or at the application site.

Do not assign a worker to clean pesticide-contaminated equipment unless that person has been instructed in the basic rules of pesticide safety. Remember that equipment cleaning presents as great a risk of exposure to pesticides as do many other pesticide handling tasks and that all parts of the equipment are likely to have pesticides or pesticide residues on them. When you clean pesticide-contaminated equipment, wear the personal protective equipment that the labeling requires for handling jobs, plus a chemical-resistant apron.

(2) Recordkeeping

Keeping records of pesticide use and application is a good idea and specific application records are required of certified applicators. Records can establish proof of proper use. If an error has been made, records are helpful in finding the cause. They also can provide you with information to use in response to claims of excess residues or damages. Good records can save you money.

Records can help you reduce pesticide mistakes or misuse. If a pest is not controlled, if damage has occurred in the target area, or if a pesticide has moved off the target area and caused problems, you may be able to determine what went wrong. Records may help you to determine that a particular condition in the treatment area caused the problem. Then you can take steps to avoid such a situation in future pesticide applications.

(3) Necessary Information

The more information you keep on record, the more useful the records will be. Devise a standard form to be sure you write down all the necessary facts each time. Keep the forms handy so you will fill them out promptly-you may not remember all the information at a later date. Record: 1) names of any handlers involved in the

activity; 2) time of day and date of application; 3) location and description of treated area, including climatic conditions at the site; 4) treated surface (plant, animal, soil, water, structure, or other surface at which the pesticide was directed; 5) target pest; 6) equipment used; 7) pesticide used-brand name, common name, formulation type, percentage of active ingredient, and EPA registration number; 8) amount of formulation used (and amount of diluent or other adjuvants added, if any); 9) total amount of pesticide applied and the rate of application (pounds per acre, ounces per 100 square feet, etc), if applicable; 10) size of treated area (total square feet, acres, or linear feet; room or structure size; number of animals, etc.)

(4) Additional Information

Every record form should have a space for additional comments. Use this space to jot down information for your own personal use or to record anything that was unique about the treatment. Record information about scouting or monitoring that may have been done. You can use this information to improve your pest management operations, either through better customer or worker relations or by saving money.

(5) Required Records

Be sure you know what records you must keep and how long you must keep them. Inspections conducted by the Pesticide Compliance unit look closely at recordkeeping, because records are a clue to the way an operation is being managed. Keep your records in a safe place where you can find them when you need them. For a discussion on records see Section I of this manual. A current list of required records is available in Chapter 487.

Pesticide Handling Decisions



SECTION 6, PESTICIDE HANDLING DECISIONS

Before you do a pesticide handling task, you need to make some important decisions. For any pesticide handling activity, you must decide how to ensure the safety of yourself, others and the environment. Before you apply a pesticide, you must make several decisions about how to fit the application to your own pest control situation.

Personal Safety Considerations

Make safety one of your first concerns every time you handle pesticides. By making a few simple decisions, you can prevent many pesticide accidents and reduce the severity of others. Ask yourself these basic safety questions:

(1) Have I Read the Labeling?

Always read the label before you open a pesticide container or begin any pesticide handling activity. Pesticide labeling contains precautions and instructions that you must follow in order to use the product safely and appropriately. It may contain very specific information that concerns the task you plan to do. Be sure you understand everything you need to know about the pesticide product before you are exposed to it.

(2) How Can I Avoid Exposure to Pesticides?

The key to personal safety when handling pesticides is to avoid exposure to them. Always keep personal clothing, food, drinks, chewing gum, tobacco products, and other belongings away from where pesticides are stored or handled. They could become contaminated and poison or injure you when you use them.

Be aware of other situations where you might be exposed to pesticides on the job. Protect yourself not only during mixing, loading and application, but also during spill cleanup, repairing or maintaining equipment, and when transporting, storing, or disposing of pesticide containers. Be particularly careful with open containers or those that have pesticides on their outer surface. Use personal protective equipment when necessary to keep pesticides from getting onto your skin and in your mouth, eyes, or lungs.

(3) What Personal Protective Equipment is Needed?

Decide what personal protective equipment you will need. You must use what the labeling requires, and you may decide that you need additional equipment. Make sure that the personal protective equipment is clean and in good operating condition.

Be sure that you know how to use the personal protective equipment correctly. Put on and remove the equipment carefully so that you will not come in contact with any pesticides that may be on the outside of it. Do not "cheat" on the personal protective equipment by taking your gloves off to make an equipment adjustment or by pulling your respirator away to scratch, wipe off sweat, or take a deep breath while you are still being exposed to the pesticide. Do not wipe your gloves on your clothing; this will contaminate your clothing, and pesticide may move to your skin.

(4) Is the Equipment Ready and Safe?

Decide what equipment is necessary for your task. Check to make sure that you have all the equipment you need. Do not allow children, livestock or pets, or unauthorized people to touch the equipment. If they are injured or poisoned, you are responsible.

(5) Am I Prepared for Emergencies?

Before you begin any pesticide handling activity, be sure you are prepared to deal with emergencies such as spills, leaks, injuries, and poisonings. Your emergency supplies should include at least:

Personal decontamination equipment - Keep plenty of clean water, detergent, and paper towels nearby in a protected container to allow for fast decontamination in an emergency. Have an extra coverall-type garment nearby in case clothing becomes soaked or saturated with pesticide and must be removed.

First aid equipment - Have a well-stocked first aid kit on hand. It should include a plastic eyewash dispenser that has a gentle flushing action.

Spill cleanup equipment - Keep a spill cleanup kit on hand at all times. The kit should contain not only all the items needed for prompt and complete spill cleanup, but also personal protective equipment to protect you while you are dealing with the spill. Know who to call in a medical emergency, and be familiar with the signs and symptoms of poisoning caused by the pesticides you handle. In a poisoning emergency, get the person out of the exposure at once, quickly summon medical assistance, and provide first aid.

(6) Are People and Animals Out of the Area?

Do not allow anyone but trained and equipped pesticide handlers to be present during any pesticide handling task. You have the legal responsibility to make sure that no one is overexposed to the pesticides that you or those you supervise are handling. Always warn workers, supervisors, and any other people who may be near the application site about which sites you plan to treat and how long they must stay out of those sites.

Pre-Application Decisions

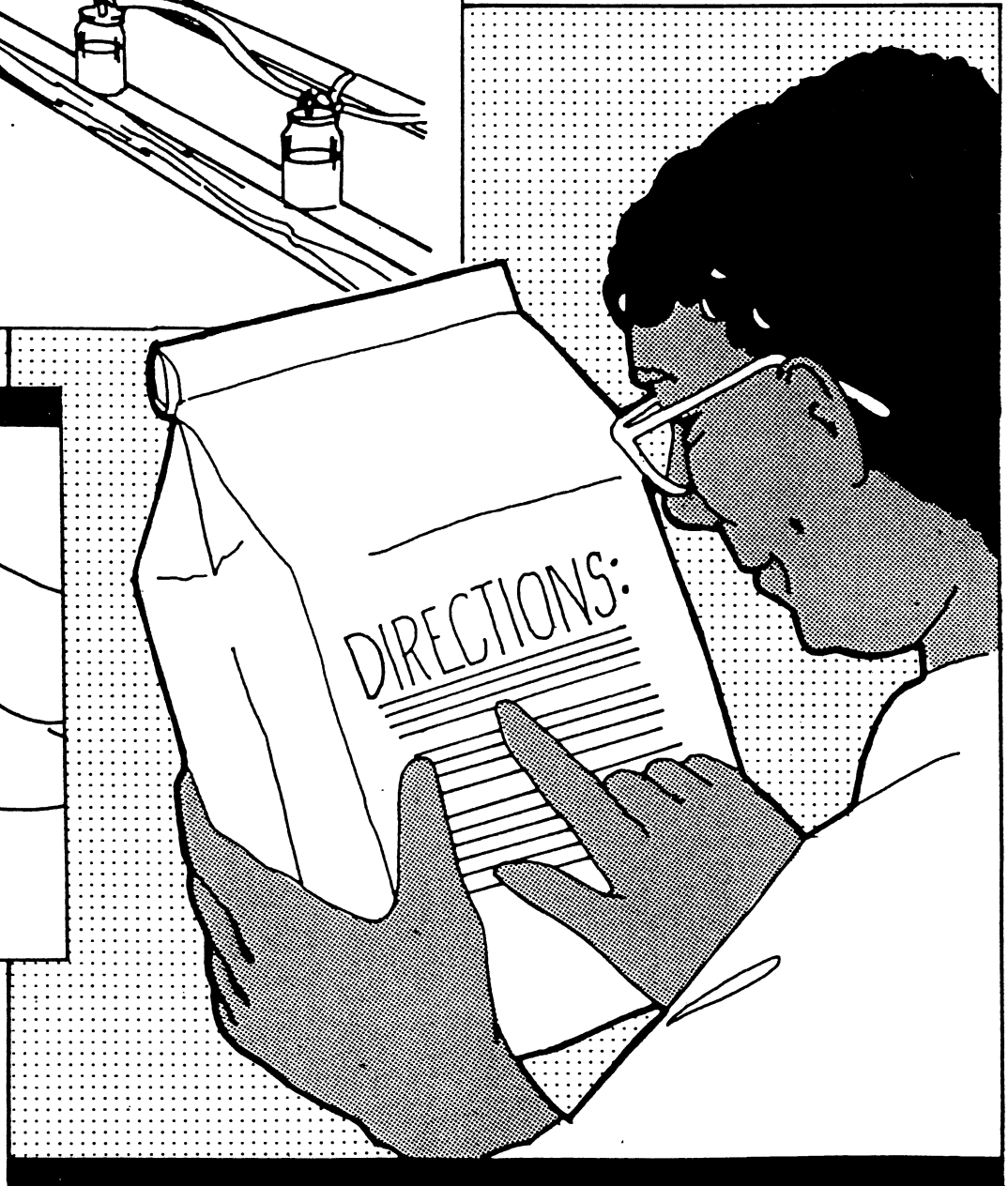
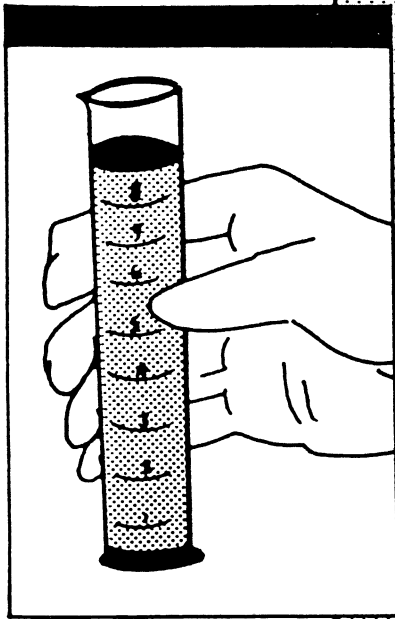
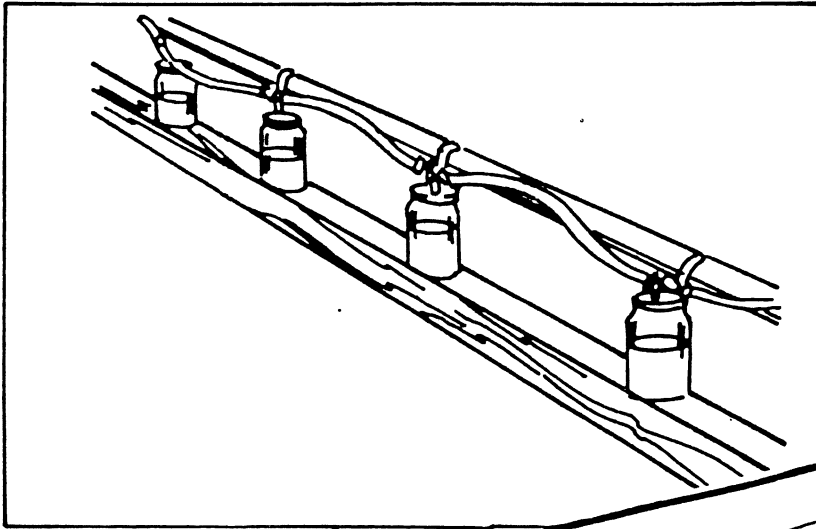
Take the time to think carefully about every pesticide application before you begin. The decisions you make will determine whether you will be using the pesticide safely and correctly. Making the wrong decisions can cause problems:

- * Incorrect use can result in wasted material, failure to control the pest, and damage to the target site.
- * Misused pesticides can cause immediate as well as long-term harmful effects to humans, to other living things, to property, and other parts of the environment.
- * Misused pesticides can result in fines as well as legal actions charging you with liability for damages.

Scheduling Pesticide Applications

Each pesticide application involves a different set of conditions. Your responsibility is to assess the conditions and decide when to apply the pesticide and take any special precautions. Sometimes you have no choice about when to schedule a pesticide application. In those situations, you must be careful to apply the pesticide safely under the existing conditions. If you have a choice about when to make an application, consider applying during "off hours". It is less likely that people other than pesticide handlers will be in the area.

Applying the Correct Amount



SECTION 7, Applying The Correct Amount

One of the most important tasks for a pesticide applicator is making sure that the correct amount of pesticide is being applied to the target site. Studies indicate that only one out of four pesticide applications is applied within an acceptable range of the intended rate. Applying either too little or too much pesticide can cause problems.

For each pesticide application, take the time to determine how much you need to apply. Then be sure that you apply the correct amount.

Underdosing is expensive. If you apply too little pesticide, you may not fully control the pest. Sometimes you can repeat the entire application, but that can be costly in both time and money. In other cases, a repeat application may not be possible because it would result in an overdose.

Overdosing is expensive because of the high cost of pesticides. Do not use any more than the amounts listed in the "Directions for Use" section of the pesticide labeling. Using more product than the labeling recommends will not do a better job of controlling pests and it is illegal. Overdosing may cause damage or injuries and may subject you to fines or liability for damages.

Deciding How Much To Apply

Study the "Directions for Use" section of the pesticide labeling to find out how much pesticide you should apply. If the label lists a range of possible amounts, use the least amount of pesticide that will achieve good control of the pest.

Calibrating Your Equipment

Most pesticide applications involve equipment that must be measured and

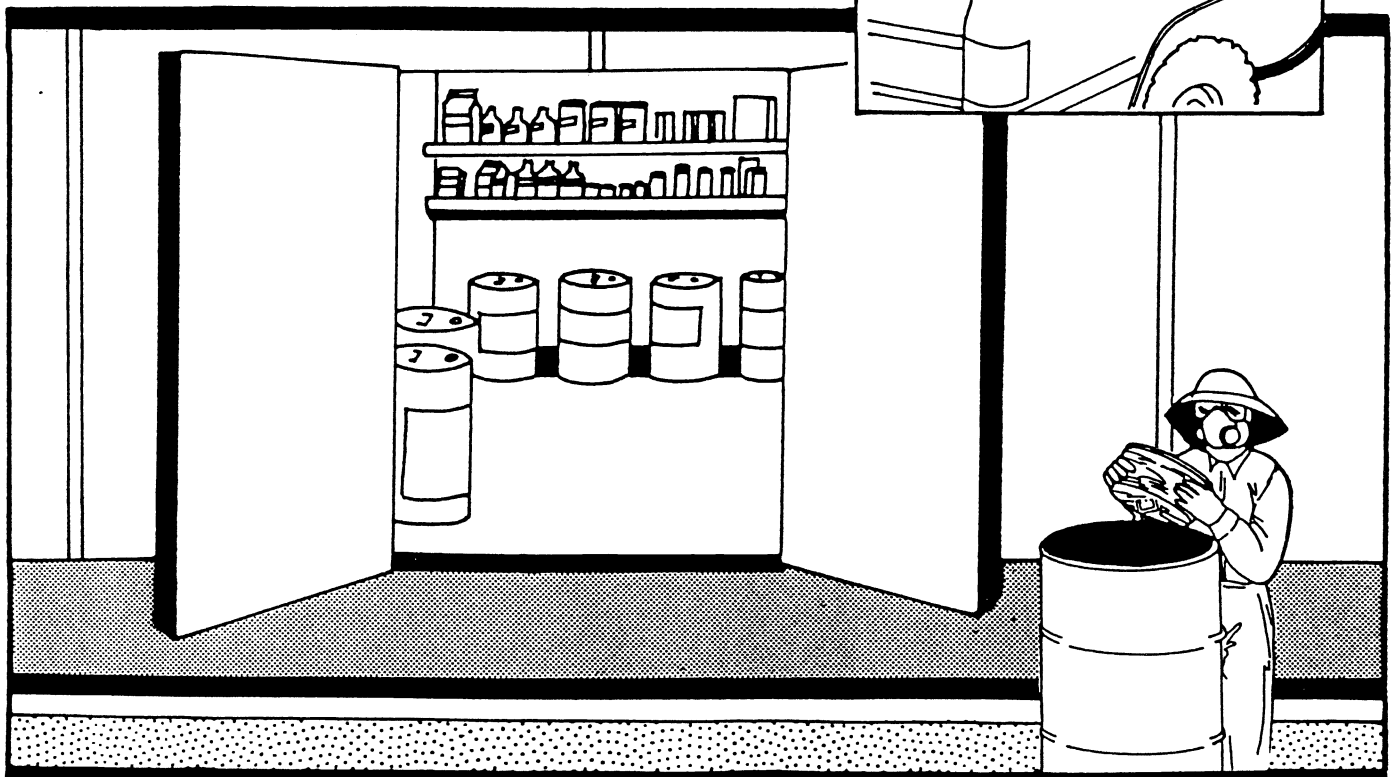
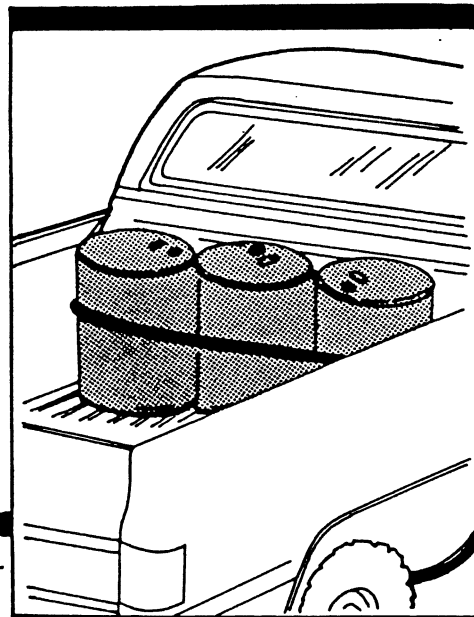
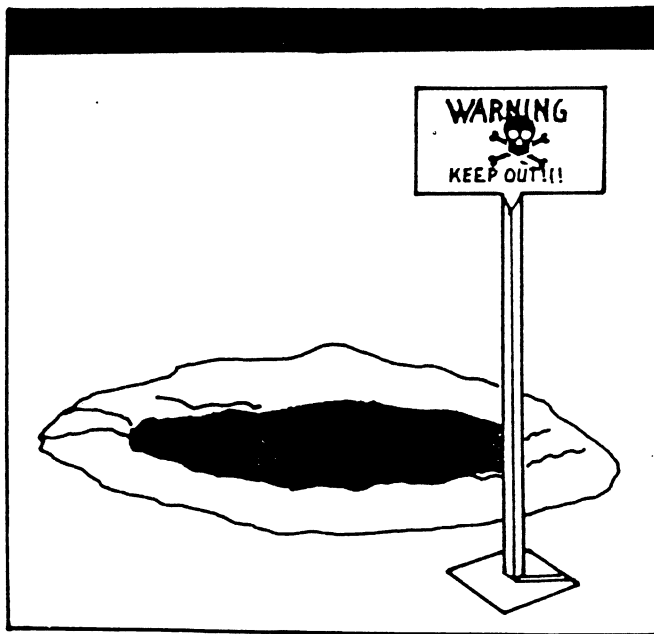
adjusted to release the correct amount of pesticide to the target site. Proper calibration is an essential but often neglected task. To be sure your equipment is releasing the right amount of pesticide, take time to calibrate it carefully and correctly. Recheck it regularly to detect changes caused by wear, corrosion and aging.

Check Calibration Often

Once you have calibrated your equipment, do not assume that it will continue to deliver the same rate during all future applications. Clogging, corrosion and wear may change the delivery rate, or the settings may gradually get out of adjustment. Take the time to check the calibration of your equipment regularly.

Be alert for possible calibration problems each time you use your application equipment. During the application, notice whether you are treating the same amount of area per load that you figured. If you find that you are covering more or less area than your figures indicated, stop application and check your figures and your equipment. If you have figured wrong or if your application equipment changes its delivery rate, you will be able to catch the mistake before you have a major problem.

Transportation, Storage, Disposal, and Spill Cleanup



Section 8, Transportation, Storage, Disposal And Spill Cleanup

When you transport, store, or dispose of pesticides and their containers, you must take safety precautions. You can prevent many pesticide accidents and reduce the severity of others, if you are prepared before you start these tasks. Before you begin any handling task know what to do in case of spills or leaks and have the proper cleanup equipment on hand.

General Concerns

- * Shield cylinders of chlorine gas from external heat sources, store away from flammable materials and other compressed gases.
- * Store cylinders on a level, dry surface.
- * Store chlorine gas in a well ventilated area. If stored inside a building, ground level ventilation fans with air intake are required. Monitoring devices with audible alarms to warn of chlorine leaks are suggested. Air changes every one to four minutes is suggested.
- * Avoid storing below grade level.
- * Always store chlorine cylinders in an upright position
- * Restraining chains or racks are recommended to prevent cylinders from being knocked over.
- * Valve protection devices must be in place on all filled cylinders.
- * Emergency equipment such as emergency kits and self contained breathing apparatus should be stored in a readily accessible area.

Transportation of Pesticides

You are responsible for the safe transport of pesticides in your possession. Transportation of chlorine gas must be conducted in a manner consistent with all Department of Transportation(DOT) rules and regulations, and each service vehicle must be in compliance with DOT regulations. Carelessness in transporting pesticides can result in broken containers, spills, leaks, environmental contamination and harm to yourself and others. Accidents can occur even when you are transporting materials a short distance. Do all you can to prevent a mishap, but be prepared in case of an emergency. Before transporting pesticides you should know what to do if a spill or leak occurs.

General concerns related to the transportation of the 20 pound cylinders of chlorine gas are as follows:

- * A rack to contain the cylinders should be securely attached to the truck. Cylinders must be properly chained during transport and stored in a rack specifically designed to prevent movement during transport.
- * Approved respiratory protective equipment.
- * Emergency instructions and first aid information in the truck cab.
- * Emergency repair tools and devices for cylinder leaks.
- * Proper cylinder labeling and vehicle placarding as required by DOT and local ordinances.

Vehicle Safety

The safest way to transport pesticides is in the back of a truck.

Never carry pesticides in the passenger

section of a car, van or truck. Hazardous vapors may be released and make the driver and other passengers ill.

Never transport pesticides with food, clothing or other items meant to be eaten by people or animals. The risk of contamination is too high.

Prevent Water Damage

Choose a storage site where water damage is not likely to occur. Water from burst pipes, spills, overflows, rain or from swimming pools can damage pesticide containers. Water or excess moisture can cause:

- * metal containers to rust
- * pesticide labeling to peel, smear, run or otherwise become unreadable.

Chlorine gas cylinders, which may rust when damp, often can be placed on pallets within the storage site.

Control The Temperature

Choose a shaded, well-ventilated area to store chlorine gas. The pesticide labeling may tell you at what temperatures the product should be stored. Excessive heat can cause plastic containers to melt, some glass containers to explode, and some pesticides to volatilize and drift away from the storage site. Temperature extremes can destroy the potency of some pesticides. The example MSDS states: *"Many metals ignite in the presence of chlorine, ie. steel at about 485 degrees. Remove chlorine from fire zones if possible."*

Provide Adequate Lighting

The storage site should be well lighted. Pesticide handlers using the facility must be able to see well enough to:

- * read pesticide container labeling,
- * notice whether containers are leaking, corroding, or otherwise disintegrating,
- * clean up spills or leaks completely.

Maintain The Storage Site

Prevent Contamination

Store only pesticides, pesticide containers, pesticide equipment, and a spill cleanup kit at the storage site. Do not keep food, drinks, tobacco, feed, medical or veterinary supplies or medication, seeds, clothing, or personal protective equipment (other than personal protective equipment necessary for emergency response) at the site. These could be contaminated by vapors, dusts, or spills and cause accidental exposure to people or animals.

Keep Labels Legible

Store pesticide containers with the label in plain sight. Costly errors can result if the wrong pesticide is chosen by mistake. Labels should always be legible. They may be damaged or destroyed by exposure to moisture, dripping pesticide, diluents, or dirt. You can use transparent tape or a coating of lacquer or polyurethane to protect the label. If the label is destroyed or damaged, request a replacement from the pesticide dealer or the pesticide formulator immediately.

Use Original Containers

Store pesticides in their original containers. Never put pesticides in containers that might cause children and other people to mistake them for food or drink. You are legally responsible if someone or something is injured by pesticides you have placed in unlabeled or unsuitable containers.

Watch For Damage

Inspect containers regularly for tears, splits, breaks, leaks, rust, or corrosion. When a container is damaged, put on appropriate personal protective equipment and take immediate action. If the damaged container is an aerosol can or fumigant tank that contains pesticides under pressure, use special care to avoid accidentally releasing the pesticide into the air.

You must know how to respond correctly when a spill occurs. Stopping large leaks or spills is often not simple. If you cannot manage a spill by yourself, get help. Even a spill that appears to be minor can endanger you, other people, and the environment if not handled correctly. Never leave a spill unattended. When in doubt, get assistance. You can get help from Chemtrec (Chemical Transportation Emergency Center) by calling 1-800-424-9300. This number is for emergencies only.

Control The Spill Situation

Protect Yourself

Put on appropriate personal protective equipment before contacting the spill or breathing its fumes. If you do not know how toxic the pesticide is or what type of personal protective equipment to wear, don't take a chance! Wear a foil-laminate apron, footwear, and gloves; eye protection; and a respirator.

Stop The Source

If a small container is leaking, place it into a larger chemical-resistant container, such as a plastic drum or bag. If a spray tank is overflowing, stop the inflow and try to cap off the tank. If a tank, hopper, or container has burst or has tipped over and is too heavy to be righted, you will not be able to stop the source. **You will need to follow the leak procedures developed by your**

company or chlorine gas manufacturer.

Protect Others

Isolate the spill site by keeping children, other unprotected people, and animals well back. Rope off the site if necessary. If you suspect the spill contains a highly volatile or explosive pesticide, you may need to keep people back even farther.

Warn people to keep out of reach of any drift or fumes. Do not use road flares or allow anyone to smoke if you suspect the leaking material is flammable.

Stay At The Site

Do not leave the spill or leak site until another knowledgeable and correctly protected person arrives, unless you have no protective equipment.

Someone should be at the spill site in proper personal protective equipment at all times until the spill is cleaned up.

Contain The Spill

As soon as the source of the leak is under control, move quickly to keep the spill in as small an area as possible. Do everything you can to keep it from spreading or getting worse.

MSDS - Storage And Handling Precautions

The MSDS may list additional precautions for storage and handling that are not included on the label, similar to the MSDS example. These are found under section **"VII - STORAGE AND HANDLING PRECAUTIONS"**.

"Do not attempt to handle, store, or use chlorine without complete review of The Chlorine Institute's Chlorine Manual."

Store properly labeled containers in a cool, dry, well-ventilated area and away from basements, pits, etc. Room vents should be located at floor level. Vapors heavier than air will collect in low areas."

"Do not remove or deface label or tag."

"Do not apply heat to chlorine containers."

"Chlorine piping and equipment must be thoroughly cleaned of organics and be moisture free before use."