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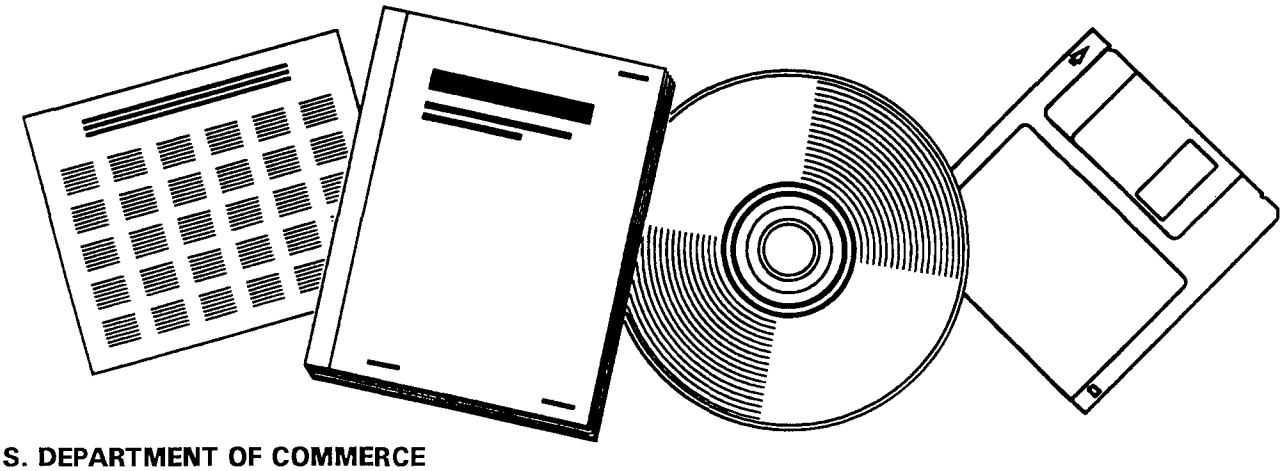
HEALTH AND SAFETY GUIDE FOR PESTICIDE FORMULATORS

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY HEALTH
CINCINNATI, OH

MAY 77



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Guide intended to assist in providing a safe and healthful work place for pesticide formulators and allied trades such as pesticide manufacturers, repackagers, distributors and applicators, where many of the same health and safety problems exist. The main topics covered include: health and safety guidelines; frequently violated regulations; occupational health and environmental control; ventilation; occupational noise exposure; contamination control; chemicals handling; ventilation; hazardous materials; personal protective equipment; sanitation; medical and first aid; fire protection; materials handling and storage; machinery and machine guarding; welding, cutting, and brazing; electrical requirements.

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HEALTH AND SAFETY GUIDE FOR PESTICIDE FORMULATORS

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Division of Technical Services
Cincinnati, Ohio 45226
May 1977

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INTRODUCTION

The Williams-Steiger "Occupational Safety and Health Act of 1970" was passed into law "to assure safe and healthful working conditions for working men and women . . ." This Act established the National Institute for Occupational Safety and Health (NIOSH) in the Department of Health, Education, and Welfare (DHEW) and the Occupational Safety and Health Administration (OSHA) in the Department of Labor (DOL). The Act provides for research, informational programs, education, and training in the field of occupational safety and health and authorizes the enforcement of standards. As part of these activities, surveys have been made by NIOSH to determine the most common health and safety problems in small businesses. This Guide was developed for distribution throughout the industry and includes a **"Guidelines"** section and a section on **"Frequently Violated Regulations."** Although this book was developed primarily for pesticide formulators, it may also be used effectively by many allied trades such as pesticide manufacturers, repackagers, distributors, and applicators, where many of the same health and safety problems exist.

While the aim of this Guide is to assist in providing a safe and healthful workplace by describing safe practices and helping to correct some of the more frequently encountered violations of safety and health standards, it is not intended to provide total information in all areas of compliance. Additional information can be found in the General Industry Standards (Code of Federal Regulations, Title 29, Part 1910 — Occupational Safety and Health Standards).

Words such as "must," "shall," "required," and "necessary," appearing in the text, indicate requirements under the Federal Regulations. Procedures indicated by "should," "suggested" constitute generally accepted good practices.

In some states, the federal government has delegated enforcement authority for occupational safety and health to the state government. Although state standards sometimes

differ from federal standards, they must be at least as effective as the federal standards.

On the last few pages of the Guide are listed addresses of NIOSH and OSHA regional offices where additional information and materials can be obtained. Consultation resulting from requests for assistance will not precipitate a compliance visit by OSHA.

GENERAL PHILOSOPHY REGARDING HEALTH AND SAFETY

Through the use of a continuing health and safety program that is actively supported by management and provides employee training, existing unsafe acts or conditions should become apparent. For many of these there may not be specific standards. Nevertheless, it is important to find a solution for these recognized problems.

During the analysis of the workplace for health and safety problems, it may also become apparent that "the letter of the law" is not being met. This may be particularly noticeable where dimensions are given for ladders, stairs, railings, etc. If it is apparent to all concerned that the "intent" of the law is being met, instead of making changes, a variance may be requested. The application for a variance must show it is "as effective as" the OSHA standards. Considerable discretion must be exercised in this area and the decision not to make changes should be made with the concurrence of OSHA. When new buildings are being constructed, renovations are being made, or new equipment is obtained, the standards must be followed.

Even when a citation is issued, it is desirable that the employer has demonstrated a willingness to comply with the intent of the law by operating effective, on-going safety and health programs, by correcting hazards in the workplace, and by maintaining records of purchases, installations, and other compliance-promoting activities. Therefore, after an OSHA compliance visit and a citation, the manager can substantiate intent to provide a safe and healthful workplace for the employees by maintaining records which document this purpose, and may be given the benefit of "good faith" to reduce penalties.

HEALTH AND SAFETY GUIDELINES

HEALTH AND SAFETY PROGRAM

Hazardous conditions or practices not covered by specific OSHA standards are covered under the general duty clause of the Act which states, "Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees." The employer can meet this requirement by utilizing an ongoing health and safety program to recognize, evaluate, and control hazards and potential hazards in the workplace.

Hazards may be identified by performing self-inspections, soliciting employee input (interviews, suggestions, and complaints), promptly investigating accidents, reviewing injury and illness records, and using material from this Guide and other sources.

The **"Checklist"** in the back of this book is of partcular importance in identifying hazards. It should be customized to fit the needs of your program.

Situations that occur frequently or cause severe problems should be given priority for corrective action. This Guide contains many of the requirements and good practices needed to correct hazards. For more complex problems, such as those requiring engineering controls to reduce noise or airborne contamination, outside consultants may be needed.

Management may want to assign safety and health responsibilities in the areas of both program development and implementation. Regular meetings and informal discussions can be held to discuss safety promotions, hazards, and injury and illness records. To ensure program success, management leadership and support are necessary. The employee(s) assigned responsibility for carrying out the program must be given the necessary authority and must have management support. Everyone in the establishment should be made aware of the program activities through a systematic interchange of information. Employees cannot take an interest in the program if they are unaware of what is occurring. Conversely, well informed employees will show an interest and a desire to participate.

EMPLOYEE TRAINING

An essential part of a health and safety program is the proper training of employees. Training needs may differ somewhat from formulator to formulator — depending on the pesticides handled, the type and layout of operating equipment, and plant size. The following suggestions for training are applicable to all formulators.

Impress upon employees the need for constant awareness — even during automatically controlled operations.

Familiarize employees with the routes of entry into the body of all potentially hazardous chemicals with which they work. Chemicals exert their toxic effects when absorbed through the skin, when inhaled, or when ingested. Employees should be made aware of the symptoms of overexposure to all hazardous chemicals, particularly pesticides. The families of employees should also be made aware of these symptoms, because the effects of exposure to some pesticides are not evident until several hours later. Prompt medical attention should be sought if the symptoms of overexposure occur.

Instruct all employees in the proper practices for handling, storing, mixing, and disposal of hazardous chemicals.

All employees should be familiar with good personal hygiene practices. For pesticide formulators, the minimum practices should include showering at the end of each shift; washing of the hands and face before eating, drinking, smoking, or using toilet facilities; prohibiting eating, drinking, or smoking in pesticide-contaminated areas; and changing work clothing daily.

Train all employees in the proper use and maintenance of personal protective equipment. (See "Personal Protective Equipment.")

Develop emergency procedures for fires, accidental leaks, spills, and employee pesticide intoxication for the various pesticides handled, and instruct employees in these procedures.

Develop "good housekeeping" practices to help reduce accidents and to develop the employees' sense of pride in their surroundings. Employees should be assigned the specific responsibility and be specially trained for cleanup.

Instruct employees in safe lifting practices. This instruction may help to prevent many injuries. An easily understood chart, "How to Lift Safely," is included in the back of this book for posting.

Have at least one employee trained in first aid on each shift.

Instruct employees in the use of portable fire extinguishers. (Refer to the fold-out chart at the back of this booklet.)

Be sure that employees who are authorized to use motorized equipment are thoroughly instructed in its operation and potential hazards. Do not permit untrained employees to operate process equipment even for a short period—they may not understand the hazards.

NIOSH has prepared an employee-related booklet "Working Safely with Pesticides" (DHEW Pub. No. 76-147) to explain some of the good work practices employees can follow to reduce their potential exposure to pesticides. Copies of the booklet are available from NIOSH or the Government Printing Office.

CHEMICALS HANDLING

Whenever hazardous chemicals are used, certain precautionary measures should be adopted to minimize the hazard to employees who work with or around them. The most important point is to limit or avoid contact with chemicals as much as possible: to prevent direct skin contact, inhalation of vapors, dusts, or mists, and to prevent ingestion.

An employee training program should be established as the first step in controlling exposure. Environmental controls, process controls, personal protective equipment, and emergency eye wash and shower facilities are also important in areas where chemicals are used extensively.

An effective training program for employees who handle chemicals should include the following points:

- the physical characteristics of the chemicals used, their possible reactivity/incompatibility with other substances, and their flammability.

- toxic properties, symptoms and effects of overexposure.

- proper techniques and practices for handling, storing, mixing, and disposal of hazardous chemicals.

- good personal hygiene habits necessary to limit effects of exposure (e.g., changing splashed clothing immediately, frequent washing of exposed skin surfaces).

- the type of personal protective equipment that may be needed, the reasons for its use, and how to use and maintain it properly.

- correct emergency procedures to follow in case a splash or spill occurs.

Local exhaust and general dilution ventilation systems operate as environmental controls to reduce the amount of chemical contaminants in the air of the work area, to remove

vapors, dusts, and mists at or near their point of origin, and to reduce fire and explosion hazards.

Process controls include enclosing operations, and covering and guarding open tanks, pits, and vats.

Personal protective equipment may be used as an additional method of protection. The equipment chosen must suit the individual exposure. If the hazard is primarily through skin contact, then aprons, gloves, and sleeves will be required; if there is the danger of splashes to the eyes, goggles and a face shield are needed; and if the chief hazard is through inhalation, then respirators must be used. The proper type of equipment is also important. Rubber is impervious to acids but may be ineffective for organic solvent exposure. Respirators which are suitable for dust control are not at all effective for mists or vapors of solvents. In some cases a supplied-air respirator must be used.

The degree of hazard a chemical presents (its toxicity) also influences the type and amount of personal protective equipment required.

Eye wash and shower facilities must be readily available for immediate emergency use. They must be located throughout the work areas where hazardous chemicals are used, and employees must be instructed in correct emergency procedures to follow.

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL

In the occupational environment, employees may be exposed to excessive levels of a variety of harmful materials including gases, dusts, mists, vapors, fumes, certain liquids and solids, and physical agents such as noise, heat, and cold. Health hazards are often not recognized because materials used are identified only by trade names. The problem is compounded by the fact that materials tend to contain mixtures of substances which makes identification still more difficult.

To begin identifying occupational health hazards, a materials analysis should be made showing all chemicals used and all products and by-products formed. All hazardous substances should be listed and evaluated and the most likely route of exposure noted (i.e., by mouth, through skin absorption, or by inhalation).

If the composition of a material cannot be determined, the information should be requested from the manufacturer or supplier who can provide Material Safety Data Sheets for the products. These sheets contain information on toxicity levels, physical characteristics, personal protective equipment requirements, emergency procedures, and incompatibilities with other substances.

Related activities such as maintenance and service operations should also be examined for health hazard potential. Examples of some hazards to watch for are:

> Welding performed around chlorinated materials may cause the formation of toxic gases in addition to welding fumes.
>
> If fork lift trucks with internal combustion engines are used for materials handling, hazardous exhaust gases such as carbon monoxide are generated.

When certain cleaning agents are mixed, poisonous gases, such as chlorine, are sometimes formed.

After a thorough analysis of the hazard potential of the chemicals used, suitable methods to eliminate or reduce employee exposure to these hazards must be implemented.

CONTROL OF EXPOSURE TO HAZARDOUS SUBSTANCES

Various methods can be used to *prevent* or *reduce* employee exposure to hazardous substances. Some of these methods, which can be used individually or in combination, are:

Substitution of less toxic materials (e.g., the use of 1,1,1-Trichloroethane for carbon tetrachloride).

Change of a process—an operation performed manually, which is automated, or enclosed.

Isolation—enclosing, or locating the hazardous process in a separate room or in a corner of the building so as to reduce the number of persons exposed. Remote or automated controls are another way of isolating a process.

Ventilation—either local exhaust ventilation where contaminants are removed at the point of generation, or, if the air contaminant has a low degree of toxicity, general dilation. ventilation.

Administrative controls—limiting the total amount of time an individual is exposed to a health hazard by rotating two or more workers each shift.

Training and education of employees—telling employees what hazards they are exposed to, and how to reduce or limit exposure. (See "Employee Training.")

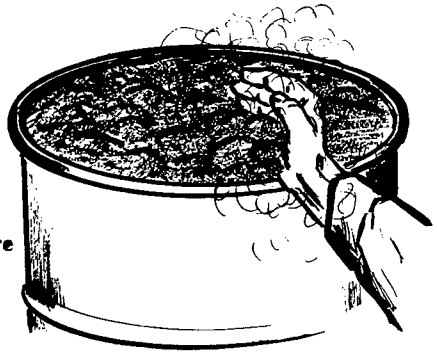
Personal hygiene—clothing should be changed and washed if it becomes contaminated with toxic chemical dusts, fumes, or liquids. This can reduce the possibility of air contaminants which have settled in the clothing from becoming airborne. Frequent washing of exposed skin areas especially before eating, drinking, smoking, or using the toilet must be emphasized.

Personal protective equipment—use of such items as respirators, hearing protection devices, protective clothing, and protective equipment. (See "Personal Protective Equipment.")

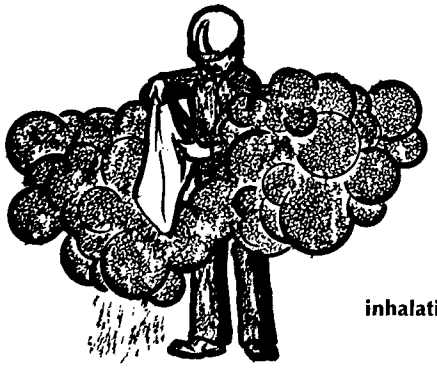
EXPOSURE HAZARDS

The user must consider the three possible methods of exposure in working with pesticides: by mouth (oral), through the skin (dermal), and by breathing the material (inhalation).

oral exposure



dermal exposure



inhalation exposure

CONTAMINATION CONTROL

The formulation and blending of pesticides involves the handling of many materials such as fillers, surfactants, emulsifiers, and organic carriers in addition to the technical grade pesticides. Many of these materials are potential health hazards when they are used or handled improperly. Inhalation of the dusts and liquid vapors must be avoided. Skin contact with concentrated or dilute active ingredients or with contaminated clothing may result in systemic poisoning of the worker or in skin irritation.

A less conspicuous form of exposure to pesticides—either by skin contact or inhalation—may result from contamination of nonmanufacturing areas. A worker with even a small amount of pesticide left on the clothing or a hard hat may contaminate lunch rooms, locker rooms, offices, automobiles, and homes. Once these areas become contaminated, they can result in an exposure which is continued even after the completion of a production run.

Several techniques can be used to prevent the cross-contamination of non-manufacturing areas:

Good Housekeeping—the first step in preventing cross-contamination. All areas of the plant must be kept as clean as possible.

Restrict Access to Production Areas—post appropriate warning signs. Only *authorized* personnel should be allowed in production areas.

Establish Controlled Change Rooms—separate locker rooms should be provided to personnel for changing from street to work clothes. Before eating—in a *designated* area—workers should remove contaminated clothing and wash the hands, arms, and face thoroughly.

Establish Laundering Procedures—work clothes should be laundered daily, and the employees or commercial

facilities doing the laundering should be advised of the hazards. Work clothes subject to heavy contamination by liquid spills should be laundered in a strong solution of detergent. *No work clothes should be taken home for laundering.*

RESTRICTED PRODUCTION AREA/ UNAUTHORIZED PERSONNEL

In many cases, restricting production areas may be accomplished by posting appropriate warning signs. Entry into restricted pesticide production areas should be on an as-needed basis, and allowed only when proper protective equipment is used. Workers leaving restricted production areas must take precautions to prevent cross-contamination from occurring.

CONTROLLED CHANGE ROOMS/ CONTROLLING CLOTHING

Various types of protective clothing may be required for employees working with pesticides. (See "Personal Protective Equipment.") The establishment of procedures requiring good personal hygiene and correct change room techniques can do much to ensure the protection of workers. During the work shift, the hands, face, and neck must be thoroughly washed with soap and water before employees eat, drink, or smoke. It is even more important to wash the hands before using the toilet than afterwards.

If work clothing becomes soiled with active ingredients, employees should be instructed to change the clothing and shower immediately. Provision should be made for the changing of clothing immediately prior to entering non-contaminated areas, at the end of the work day, and at break or other times, in order to minimize the chance of cross-contamination.

It has been shown that the laundering of contaminated work clothing at home may also present a hazard to the families of workers. Even trace amounts of some chemicals which may be present on the clothing can have long term effects on the families of the workers.

Leather shoes, belts, watchbands, and other jewelry should be left in the employees' lockers with their street clothes to prevent entrapment of chemicals under them, or to prevent the chemicals from being absorbed by the leather.

HOUSEKEEPING

In addition to the previously mentioned procedures, extensive efforts must be made to keep all areas of the plant as clean as possible. This includes warehousing and production areas, offices, restrooms, and lunch rooms. All surfaces, walls, floors, and overhead structures (which collect settled dust) must be kept clean. The preferred method for cleanup is a vacuum with a special, high-efficiency type exhaust filter. The use of an air hose or broom for cleanup may often recreate a problem by recirculating contaminants.

Maintaining a clean and orderly workplace reduces the danger of fires. Combustible material of any type should be stored only in areas that are isolated by fire-resistant construction.

Rubbish should be disposed of regularly. If it is necessary to store combustible waste materials, a covered receptacle is required.

MAINTENANCE

Maintenance plays an important part in the control of potential hazards. Preventive maintenance of valves, motors, and pumps can prevent major leaks and breakdowns. If a leak should occur, proper design of the equipment can minimize the impact of the problem. Centralizing pumps and valves, the most common sources of leaks, and diking will aid in confining leakage. Collecting leakage and spills in a sump will prevent pollution of the environment. The overhead placement of pipes, rather than locating them in underground trenches, will allow rapid detection of even small leaks.

Precautions must be taken, especially during equipment cleaning and repair, and equipment or product change-over, to protect the employees from exposure to toxic substances. Equipment contaminated with a pesticide should be washed with an appropriate decontaminating solution before work begins.

Maintenance work may also present a significant hazard to the worker. Since maintenance personnel work in all areas of the plant, they are also exposed to all of the hazards which may be present. Maintenance personnel need special training in recognizing and avoiding hazards, and in the proper use of personal protective equipment for the various manufacturing areas.

FIRE HAZARDS/EMERGENCY PROCEDURES

Standard procedures should be developed for fire emergencies, and employees should be thoroughly familiar with these procedures. The most important consideration is the availability of instant emergency egress for the employees. Local police and fire authorities should be alerted to the hazards associated with your operation.

Frequently, the manufacturer or supplier of a substance can provide Material Safety Data Sheets which contain informa-

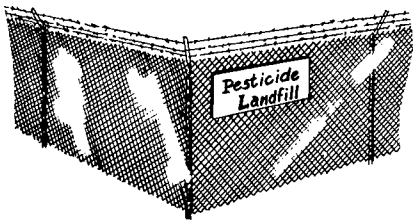
tion about the materials such as toxicity levels, physical characteristics, protective equipment requirements, firefighting and emergency procedures, and incompatibilities with other substances.

All persons responsible for fire protection should know the flashpoint and explosion hazards of all chemicals in use, the toxicity of their vapors and combustion products, and the appropriate respirator for use in firefighting. Most of this data is supplied on the MSDS.

In an emergency, the National Agricultural Chemicals Association (Telephone No. 1-513-961-4300) or the Manufacturing Chemists Association ("Chemtrek" Telephone No. 1-800-424-9300) may supply information.

DISPOSAL OF PLANT WASTES

Disposal of "empty" pesticide containers and spillage or sweepings which cannot be reprocessed can create health hazards to employees as well as to the environment and the general public. Toxic chemicals or materials which have been in contact with these chemicals should not be discarded on a rubbish heap or flushed into the public sewer system. Solid and liquid waste disposal procedures must be in compliance with local, state, and federal environmental protection regulations to prevent air and water pollution.



The following **general** guidelines for limiting exposure should be considered when reviewing waste disposal procedures:

Empty cans or drums which have held pesticide must not be allowed to accumulate; should not be reused, except for chemical handling after thorough detoxification and cleaning; and must not be taken from the plant for home use by employees.

Glass containers which have contained toxic material should be thoroughly rinsed, broken, and buried in a specially designated pesticide landfill. Drums containing non-recoverable solid pesticide waste for disposal by incineration or in a landfill must be properly labeled.

All toxic liquid waste must be contained on the plant

premises until it is removed or is detoxified and released into sewer or waterways.

When disposal of toxic wastes is handled by outside firms under contract, the persons performing the operation must be informed of the hazardous nature of these wastes.

Methods for detoxification and disposal of waste chemicals should be periodically reviewed to ensure that proper methods are followed to prevent **worker** exposure to the chemicals.

Dust from bags or cartons that have held pesticides must be controlled by local exhaust ventilation during bundling and compacting. Skin and eye contact with the bags and the dust must also be prevented through the use of personal protective equipment such as gloves, goggles, and coveralls or aprons.

Personal protective equipment (gloves, goggles, etc.) and respirators must be used when employees are handling or transporting bundled material to waste containers and are not able to use local exhaust ventilation.

Fiber or metal drums which have contained pesticides should be rinsed thoroughly and drained before perforation and disposal in a landfill specifically designated for toxic materials. Workers performing these tasks must be properly protected from exposure to the pesticide.

STANDARDS COMPLETION PROGRAM (SCP)

Supplementary occupational health information on toxic chemicals is being developed through a joint project between NIOSH and OSHA. The SCP will expand existing health standards for some 400 substances presently regulated and listed in Table Z-1 of the 1910 Standards. These proposed expanded health standards detail environmental and medical monitoring methods and requirements, procedures for safe handling, and respirator, personal protective equipment, labeling, and exposure recordkeeping requirements.

The pesticides presently listed in the 1910 Standards and included in the SCP are:

Ammonium sulfamate (Ammate®)
Carbaryl (Sevin®)
Chlordane
2, 4-D
Dichlorvos (DDVP®)
Malathion
Methoxychlor
Pival®
Aldrin
Demetron (Systox®)
Endrin
EPN
Crag Herbicide®
Pyrethrum
Ferbam
Pentachlorophenol
Sulphur
Butyl mercaptan
Ethylene dibromide
Phosphorus
DDT
Heptachlor
Methyl bromide
Lead arsenate
Paraquat
Parathion
Phosdrin®
2, 4, 5-T
TEDP
TEPP
Toxaphene
Warfarin
Thiram
alpha-napthyl-thiourea (ANTU)
Dieldrin
Lindane
Rotenone
Strychnine
Sodium fluoroacetate
Methyl mercaptan
Ronnel
Dinitro-o-cresol
Azinophos-methyl
para-Dichlorobenzene
Hydrogen cyanide
Nicotine

"Guidelines" from the SCP are being published by NIOSH and will be available in January 1978. The Guidelines list medical monitoring requirements, respirator and personal protective equipment selection criteria, and present the toxicology of each substance.

FREQUENTLY VIOLATED REGULATIONS

This section outlines the OSHA regulations which are most applicable to general plant conditions and operations found in pesticide formulating. The standards are listed in the same order as the OSHA regulations and the important points of each standard are summarized.

General conditions and controls are discussed. Your particular operation may vary, so some of these standards may not apply or additional standards may also be applicable. The control methods presented are only a brief, general suggestion as to how problems may be corrected. Where specific designs such as for noise control, control of air contaminants, ventilation systems, and closed transfer operations are needed, you may need the services of a professional consultant.

WALKING AND WORKING SURFACES

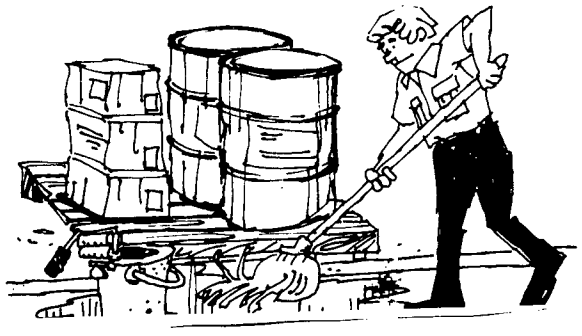
GENERAL REQUIREMENTS

The workplace must be maintained in a clean, orderly, sanitary, and as far as possible, in a dry condition. All spills should be cleaned up promptly. Areas which are constantly wet should have nonslip surfaces where personnel normally walk or work.

All permanent aisles must be easily recognizable. Usually, aisles are indicated by painting or taping lines on the floor. Where mechanical handling equipment such as lift trucks is used, sufficient safe clearances must be maintained for foot and vehicular traffic wherever turns or passage must be made. Aisles must not be obstructed.

All chutes and dumpbin floor openings must be guarded by covers. If there are openings where employees must feed material through, the chute must have some type of protection to prevent a person from falling through the opening.

The floor load capacity, which is the maximum weight capable of being supported by the floor, must be posted in a readily visible location (except for slab floors with no basements).



WALKING AND WORKING SURFACES (cont.)

THE STANDARD GUARD RAIL AND TOEBOARD

A standard guard railing consists of a top rail, intermediate rail, and posts. The nominal distance from the upper surface of the top rail to the floor, platform, runway, or ramp must be 42 inches. There must be an intermediate rail spaced approximately halfway between the top rail and the floor.

A standard guard railing can be of any configuration and construction that meets the basic dimension requirements (42 inches high with midrail), and can withstand 200 pounds applied in any direction at any point on the top rail.

The standard toeboard must be approximately 4 inches in height from the floor to the top edge, with no more than a ¼-inch gap between the toeboard and the floor. The toeboard may be constructed of any solid or perforated substantial material, as long as the openings are smaller than 1 inch.

As a general condition, a standard toeboard and guard railing are required wherever people walk beneath the open sides of a platform or under similar structures, or where things could fall from the structure (for example, into machinery below).

WALKING AND WORKING SURFACES (cont.)

PORTABLE LADDERS

Must be maintained in good condition at all times. They must be inspected frequently, and those which have developed defects such as broken or loose steps or cracked rails must be removed from service for repair or destruction.

Ladders must be placed so that the side rails have a secure fitting. They may not be placed on boxes, barrels, or other unstable bases to obtain additional height. Nonslip bases should be used. Metal ladders must not be used near energized electrical equipment.

FIXED INDUSTRIAL STAIRS

Riser height and tread width must be uniform throughout any flight of stairs. All treads must be reasonably slip resistant.

Vertical clearance above any stair tread to any overhead obstruction must be at least 7 feet, measured from the leading edge of the tread.

The minimum permissible width for stairs is 22 inches. If they are a means of exit access, they must be at least 28 inches wide. All stairs should be adequately lighted and equipped with handrails.

FIXED LADDERS

Fixed ladders must be designed to support the intended load, with rungs of sufficient diameter to provide strong and secure footing. The ladders must be installed so that sufficient safe clearance for climbing is allowed. They must have side rails which extend 3½ feet above landings; and if they are more than 20 feet long, they must be equipped with cages.

EXITS AND EXIT MARKINGS

Areas around exits, and passageways leading to and from the exit must be free of obstructions. All exits must be indicated with a clearly visible sign. When the direction to the nearest exit may not be apparent to an occupant, an exit sign with an arrow indicating direction must be used.

Doors, passageways, or stairways which are neither exits nor ways to an exit, but which may be mistaken for an exit, must be marked "NOT AN EXIT" or marked by a sign to indicate their actual use.

Exit access must be arranged so that it is unnecessary to travel toward any area of high hazard potential in order to reach the nearest exit, unless the path of travel is effectively shielded. No lock or fastening may be used to prevent escape from inside a building.

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL

Persons working in the pesticide formulating industry may be exposed to a wide variety of pesticides (active ingredients), solvents, surfactants, wetting agents, fillers, and emulsifiers. All of these materials can cause occupational health problems.

Where employees are exposed to hazardous concentrations of toxic materials, exposure must be reduced to acceptable levels by either engineering or administrative means. **The use of respirators is acceptable only during the implementation of engineering controls, or if engineering controls are not feasible.** The chief methods for controlling exposure include substitution, mechanical exhaust ventilation, isolation, automation and other equipment controls.

ACTIVE INGREDIENT

The pesticide ingredient in most instances, presents the greatest hazard to the employee. The most common types of pesticides can be classified as follows:

The **organic phosphorus materials:** highly toxic Parathion, TEPP, EPN, Systox®, Phosdrin®, Phorate (Thimet®), and Methyl parathion; and those less toxic such as Malathion, Chlorthion, Ronnel (Korlan®), Diazinon, Dicapthon, and Trichlorfon. These materials cause injury by inhibiting action of the enzyme cholinesterase.

The **chlorinated hydrocarbons:** Aldrin, Dieldrin, Chlordane, DDT, and DDD. These chemicals can produce intoxication by acting on the central nervous system. Chlordane is suspected of being a cause of blood dyscrasias, i.e., leukemia in persons exposed.

The **carbamates,** such as Carbaryl (Sevin®), which also act on the enzyme cholinesterase. Pesticides such as Carbaryl are slight cholinesterase inhibitors. Continued careless production techniques resulting in long-term, low-level exposure may result in a depressed cholinesterase level. A subsequent exposure to an organophosphate pesticide, that would normally not result in a problem, might do so if the exposure occurs before the body's cholinesterase activity is restored.

Presently, there are approximately 40 commercial pesticides regulated by OSHA standards (Table Z-1, 29 CFR 1910.1000). The exposure limits for some of these pesticides, however, are applicable to airborne concentration, and may not take into account skin exposure—an additional toxic route of entry for many pesticides.

A fold-out chart in the back of this Guide contains specific information on symptoms of exposure, antidotes, and special handling procedures for some of the above-mentioned substances.

SOLVENTS

Deodorized kerosene, xylene, and a number of chlorinated hydrocarbons are the organic solvents commonly used in pesticide formulations. The primary routes of exposure are through inhalation of vapors and by direct skin contact with the liquid. Skin contact with solvents may cause dermatitis, ranging in severity from an irritation to actual damage to the skin. Even the most inert solvents can dissolve the natural protective barriers of the skin, leaving it unprotected and possibly open to dermatitis or serious infection.

Continued inhalation of solvent vapors may cause impairment which has no discernible permanent health effects, but which may increase the possibility of accidents through lack

of coordination and drowsiness. Most solvents may have some effect on the central nervous system. In some cases, exposure may result in serious damage to the blood, lungs, kidneys, liver, and gastrointestinal tract.

Substitution applied to solvents in pesticide formulations may present several advantages. For example, substitution of a petroleum naphtha for xylene may reduce the overall toxicity of the formulation. From a safety standpoint, if substitution raises the flashpoint of the liquid formulation to above 100° F, the formulation may be taken out of the flammable liquid classification, thus reducing the fire hazard potential and easing storage requirements.

While this control method has limited application, the substitution principle should be followed wherever possible to reduce the hazard potential to both the formulator and the customer.

FILLERS

Fillers such as clays and talc may contain **free silica,** and talcs may contain **asbestos.** Both of these, when inhaled in excessive amounts, cause an increase in the amount of fibrous connective tissue (fibrosis) in the lungs, and result in impaired breathing. The symptoms of overexposure to asbestos or free silica may not clinically be "seen" for 10 to 20 years, depending on levels and duration of exposure.

Every establishment where asbestos may become airborne must be surveyed, at least initially, to determine the amount of employee exposure to asbestos fibers.

No asbestos-containing material may be removed from bags, cartons, or other shipping containers without being either wetted, enclosed, or exhaust ventilated so as to effectively prevent the airborne concentration of asbestos fibers in excess of OSHA standards. Engineering controls must be

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL (cont.)

the first method employed to limit employee exposure to asbestos. Approved respirators may be used only during the installation of engineering controls, emergencies, or when control methods are technically not feasible. Employees exposed to asbestos must be given an annual physical examination which includes a chest x-ray and pulmonary function tests. Records of exposure and examinations must be maintained for 20 years.

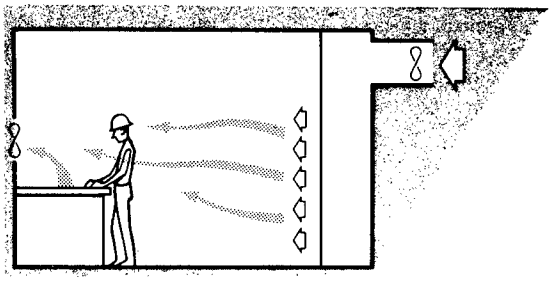
If it is determined that the filler material does contain asbestos or free silica, appropriate substitutes should be sought.

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL (cont.)

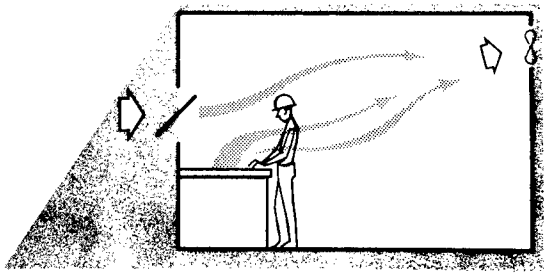
VENTILATION

Mechanical local exhaust ventilation is, in most cases, the first choice for control of air contaminants which are potential health hazards. A properly designed local exhaust or dilution ventilation system will either remove air contaminants which may be present, or lower the concentration of fumes, vapors, dusts, mists, or other contaminants generated in the work environment to reduce or eliminate health or fire hazards.

Local exhaust ventilation removes the hazardous materials at or near their point of origin, and prevents them from being drawn through the breathing zone of the worker. Local exhaust ventilation usually performs more efficiently than dilution ventilation and prevents air contaminants from being circulated throughout the work area.



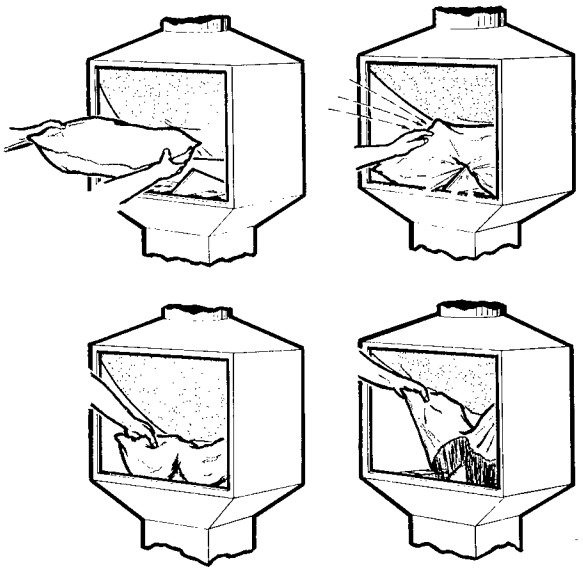
Good system — fresh air carries fumes away from worker



Bad system — incoming air draws vapors past worker.

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL (cont.)

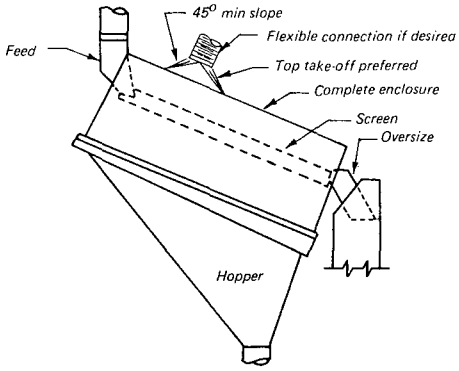
Local exhaust systems should be installed wherever a large amount of air contaminant is generated, or where a particularly hazardous substance is used. Operations which usually require the use of local exhaust ventilation are the transfer of materials into or from processing vessels and packaging.



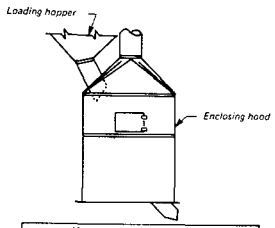
Flexible cover on hopper reduces dust emissions

General dilution ventilation depends upon pulling a sufficient volume of air through the work area to dilute the contaminants to a lower, or non-hazardous, level. Dilution ventilation requires a greater volume of air movement for efficient operation than does a local exhaust system. General dilution ventilation may be an effective control for areas where low concentrations of hazardous substances are generated. It may be used effectively in some flammable liquid storage areas or with low hazard potential substances.

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL (cont.)

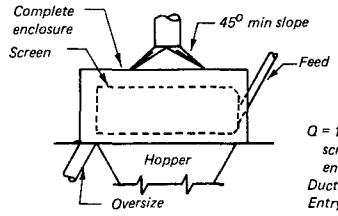


FLAT DECK SCREEN
Q = 200 cfm/sq ft through hood openings, but not less than 50 cfm/sq ft screen area. No increase for multiple decks
Duct velocity = 3500 fpm minimum
Entry loss = 0.50 VP



Minimum Exhaust Volumes for Mixers	
Mixer Diameter (feet)	Minimum Exhaust (cfm)
4	600
4	750
6	900
7	1050
8	1200
10	1575

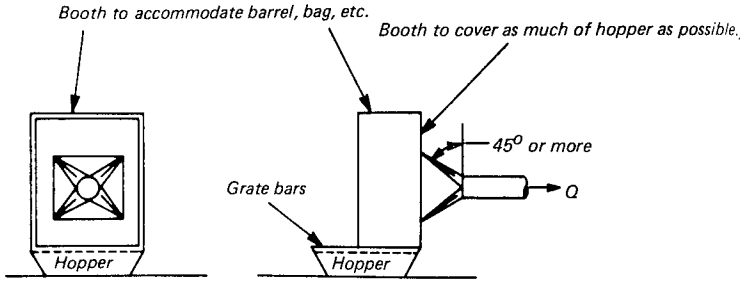
Q = 150 cfm/sq ft through all openings, but not less than the table values
Duct velocity = 3500 fpm minimum
Entry loss = entry loss factor for tapered hood X duct VP



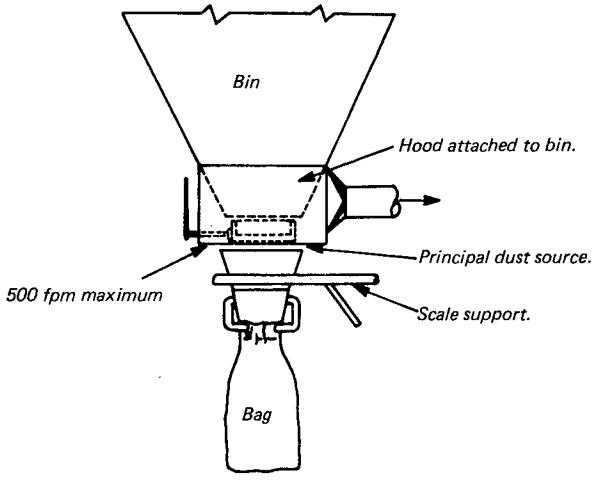
CYLINDRICAL SCREEN
Q = 100 cfm/sq ft circular cross section of screen; at least 400 cfm/sq ft of enclosure opening
Duct velocity = 3500 fpm minimum
Entry loss = 0.50 VP

The design of ventilation systems is complex, and involves determination of the volume of air which needs to be moved, the velocity required to capture and convey the contaminants, the type of fan which will adequately exhaust the air volume, the placement of the exhausts, makeup air inlets, and the overall positioning of the system. A mechanical engineer should be consulted to assist in providing an effective environmental control through the use of a ventilation system.

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL (cont.)

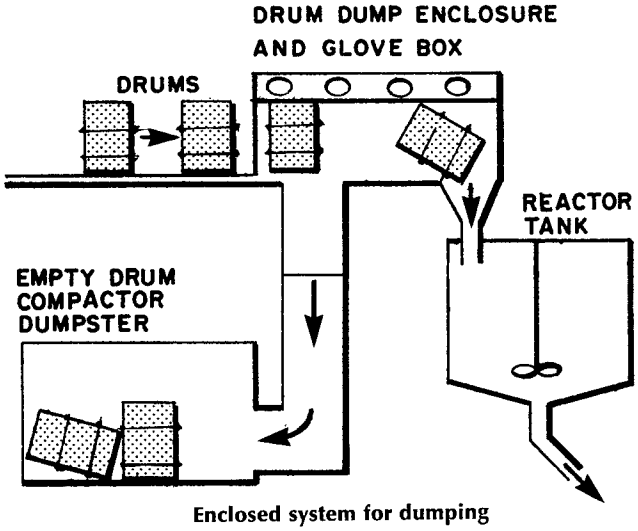


Q = minimum 150 cfm/sq ft of hood face
Entry loss = entry loss factor for tapered hood x duct VP
Duct velocity = 3500 fpm minimum

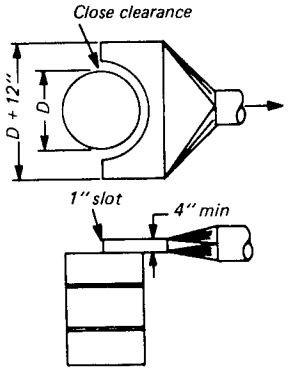


Minimum Q = 400 cfm for non-toxic, nuisance dust
= 1000 cfm for toxic dust
Dust velocity = 3500 fpm minimum
Entry loss = entry loss factor for tapered hood x duct VP

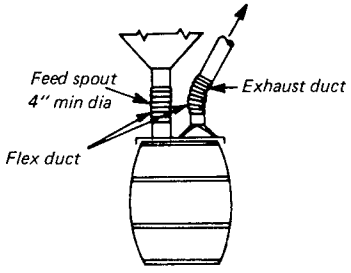
Exhaust for bag filling operations



Enclosed system for dumping material in drums



Minimum Q = 100 cfm/sq ft barrel top min
Duct velocity = 3500 minimum
Entry loss = 1.78 slot VP + entry loss factor for tapered hood x duct VP
Manual loading only.



Minimum Q = 50 cfm x drum dia (ft) for weighted lid
= 150 cfm x drum dia (ft) for loose lid
Duct velocity = 3500 fpm minimum
Entry loss = entry loss factor for tapered hood x duct VP

Exhaust for barrel filling

OCCUPATIONAL NOISE EXPOSURE

Excessive noise can cause permanent hearing damage; yet the noise standard is one of the most commonly violated standards. It is management's responsibility to make sure employees are not exposed to noise levels in excess of the standard.

The current standard is 90 decibels, A-weighted (dBA), for an 8-hour exposure. Even at this noise level, hearing damage can be expected in some individuals. It may soon be a requirement, and it is considered good practice, to have hearing checked (audiometric testing) on an annual basis for all employees exposed to 85-90 dBA noise levels for 8 hours daily. If no hearing loss is observed, ear protection is not required.

At greater than 90 dBA exposure (8 hours per day) or for higher noise levels in excess of the allowable time (e.g., 100 dBA for more than 2 hours) a continuing, effective hearing conservation program must be administered. Reference to the following table gives estimates of noise levels and the maximum allowable exposure times. It is required that either engineering controls such as enclosing noisy equipment, or administrative controls, such as limiting time of exposure, be utilized to reduce noise levels or the exposure times to comply with the standard. If these control measures are not feasible, then effective personal protective equipment is required. There are many forms and types of ear protection than can be used such as ear muffs or ear plugs. Some are more useful than others, depending on the noise level, the frequency of the noise, and how well they fit the individual. It is necessary to provide protection that is effective and yet reasonably comfortable to the wearer.

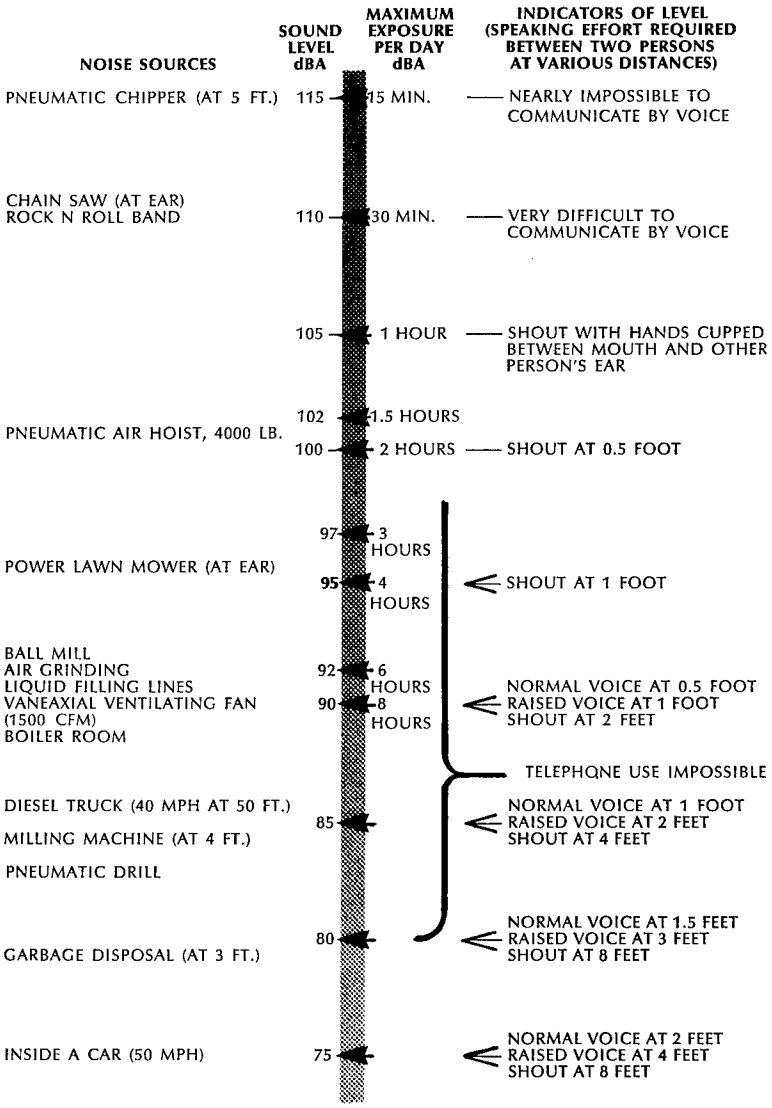
The following table is provided to assist in the evaluation of the noise levels in the workplace. If referral to the table indicates that levels and time of exposure are such that cor-

OCCUPATIONAL NOISE EXPOSURE (cont.)

rective action is needed, it is recommended that professional help be sought to correct the problem. A noise survey by adequately equipped and trained personnel should be made before engineering and administrative controls are implemented or a hearing conservation program is established.

OCCUPATIONAL NOISE EXPOSURE (cont.)

PERMISSIBLE NOISE EXPOSURES



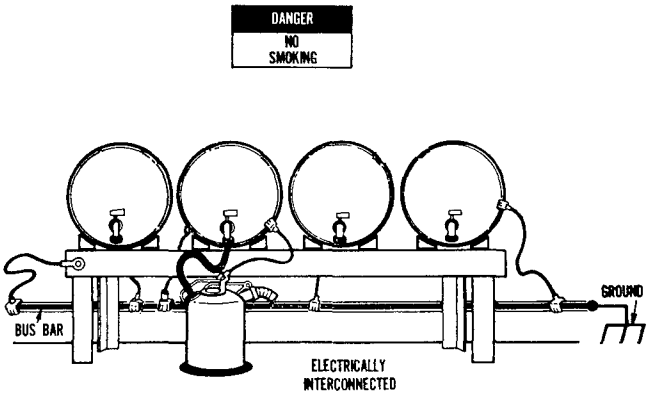
HAZARDOUS MATERIALS

FLAMMABLE AND COMBUSTIBLE LIQUIDS

The category of flammable and combustible liquids is determined by how easily they ignite (the flashpoint). Flammable liquids ignite more readily than combustible ones. Examples of flammables are gasoline, acetone, and lacquer thinner; examples of combustibles are kerosene, fuel oil, and Stoddard solvent.

Connections on all drums and piped systems of flammable and combustible liquids must be vapor and liquid tight.

When flammable liquids are transferred from one container to another (e.g., from a bulk container to a portable container), the containers must be effectively bonded and grounded. This practice prevents electrical discharge (i.e., sparks) from the accumulation of static charge because of the transfer process.



Drums grounded and bonded to receiving container

All spills of flammable and combustible liquids must be cleaned up promptly. Cleanup personnel must use appropriate personal protective equipment. If a major spill occurs, remove all ignition sources and ventilate the area. These

HAZARDOUS MATERIALS (cont.)

liquids must never be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.

Supplies of flammable and combustible liquids must be stored in approved, fire-resistant safety containers equipped with self-closing lids.

All flammable liquids must be kept in closed containers when not in use.

Combustible waste material, such as oily rags and wipes, must be stored in covered metal containers and be disposed of daily.

All storage areas must be posted as "NO SMOKING" areas.

HAZARDOUS MATERIALS (cont.)

CLASSIFICATION OF SOME TYPICAL FLAMMABLE AND COMBUSTIBLE PRODUCTS

	Class	FLAMMABLES	Flash Point	Boiling Point
	A	Gasoline (some) Pentane	Lower than 73°F	Lower than 100°F
I	B	Acetone Denatured Alcohol Gasoline (some) Naphtha, VM and P Toluene	Lower than 73°F	At or Above 100°F
	C	Xylene	At or Above 73°F	
II		COMBUSTIBLES Kerosene Mineral Spirits Naphtha Stoddard Solvent	At or Above 100°F	
III		Asphalt Brake Fluid Fuel Oil #4 Fuel Oil #5 Fuel Oil #6	At or Above 140°F	

STORAGE IN INSIDE ROOMS

Fire protection* provided	Fire resistance	Maximum size	Total allowable quantities (gals./sq. ft. floor area)
Yes	2 hours	500 sq. ft.	10
No	2 hours	500 sq. ft.	4
Yes	1 hour	150 sq. ft.	5
No	1 hour	150 sq. ft.	2

*Fire protection system shall be sprinkler, water spray, carbon dioxide, or other system.

HAZARDOUS MATERIALS (cont.)

DRUM STORAGE INSIDE STORAGE ROOMS

Adequate venting should be provided in all areas where flammable liquids are stored. Roof venting is very important in the event of a fire because it allows smoke and heat to escape, and also allows firefighters to get nearer to the fire area.

Storage areas for flammables must be isolated by standard firewalls and must be prominently posted "NO SMOKING." Openings to other rooms or buildings must be provided with noncombustible, raised, liquid-tight sills or ramps at least 4 inches in height. A permissible alternative to a sill or ramp is an open-grated trench which drains to a safe location.

General exhaust ventilation (either gravity or mechanical) which provides for a complete change of air within a room at least six times each hour is required for inside storage rooms for flammable and combustible liquids.

Permissible storage quantities and pile height are:

INDOOR CONTAINER STORAGE

Class liquid	Storage level	Protected storage Maximum per pile		Unprotected storage Maximum per pile	
		Gallons	Height	Gallons	Height
I-A	Ground and upper floors	2,750 (50)	3 ft. (1)	660 (12)	3 ft. (1)
	Basement	Not permitted		Not permitted	
I-B	Ground and upper floors	5,500 (100)	6 ft. (2)	1,375 (25)	3 ft. (1)
	Basement	Not permitted		Not permitted	
I-C	Ground and upper floors	16,500 (300)	6 ft. (2)	4,125 (75)	3 ft. (1)
	Basement	Not permitted		Not permitted	
II	Ground and upper floors	16,500 (300)	9 ft. (3)	4,125 (75)	9 ft. (3)
	Basement	5,500 (100)	9 ft. (3)	Not permitted	
III	Ground and upper floors	55,000 (1,000)	15 ft. (5)	13,750 (250)	12 ft. (4)
	Basement	8,250 (450)	9 ft. (3)	Not permitted	

NOTE 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage permitted in that pile shall be the smallest of 2 or more separate maximum gallonages.

NOTE 2: Aisles shall be provided so that no container is more than 12 ft. from an aisle. Main aisles shall be at least 8 ft. wide and side aisles at least 4 ft. wide.

NOTE 3: Each pile shall be separate from each other by at least 4 ft.

(Numbers in parentheses indicate corresponding number of 55-gal. drums.)

OUTSIDE STORAGE

If flammable and combustible liquids are stored outside, the area should be graded so that spills are diverted away from buildings and public sewers. The storage area must be kept free of combustible material not necessary for storage, such as weeds and other debris. The area must be posted "NO SMOKING."

OUTDOOR CONTAINER STORAGE

1	2	3	4	5
Class	Maximum per pile (see note 1)	Distance between piles (see note 2)	Distance to property line that can be built upon (see notes 3 and 4)	Distance to street, alley, public way (see note 4)
	gal.	*ft.*	*ft.*	*ft.*
IA	1,100	5	20	10
IB	2,200	5	20	10
IC	4,400	5	20	10
II	8,800	5	10	5
III	22,000	5	10	5

NOTE 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage in that pile shall be the smallest of the 2 or more separate gallonages.

NOTE 2: Within 200 ft. of each container, there shall be a 12-ft. wide access way to permit approach of fire control apparatus.

NOTE 3: The distances listed apply to properties that have protection for exposures as defined. If there are exposures, and such protection for exposures does not exist, the distances in column 4 shall be doubled.

NOTE 4: When total quantity stored does not exceed 50 percent of maximum per pile, the distances in columns 4 and 5 may be reduced 50 percent, but not less than 3 ft.

HAZARDOUS MATERIALS (cont.)

BULK STORAGE

Provisions must be made to insure that flammable or combustible liquids do not enter public sewers, drainage systems, natural waterways, or become a hazard due to spills during operations. Spills can occur from tank rupture, valve and piping malfunctions, or failure to follow standard procedures.

ABOVEGROUND STORAGE TANKS

Aboveground tanks must be located according to the design and working pressure of the tank, emergency venting capability installed (if any), the volume of the tanks, and the characteristics of the flammable or combustible contents.

The following tables provide a means for determining the minimum distance between an aboveground storage tank and the location of buildings to be protected. Table H-5 is for tanks operating at or less than 2.5 pounds per square inch gauge (psig). Table H-6 is for tanks operating at pressures exceeding 2.5 psig. In some instances Tables H-5 and H-6 refer to Table H-7 to obtain the minimum distance. Table H-9 is the minimum distance reference.

"Protection for exposures" means that adequate fire protection for structures near the tanks must be provided whenever there are employees working in the area.

TABLE H-5

Type of tank	Protection	Minimum distance in feet from property line which may be built upon, including the opposite side of a public way	Minimum distance in feet from nearest side of any public way or from nearest important building and shall be not less than 5 feet
Floating roof	Protection for exposures.	½ times diameter of tank but need not exceed 90 ft.	⅙ times diameter of tank but need not exceed 30 ft.
	None	Diameter of tank but need not exceed 175 ft.	⅙ times diameter of tank but need not exceed 30 ft.
Vertical with weak roof to shell seam.	Approved foam or inerting system on the tank.	½ times diameter of tank but need not exceed 90 ft. and shall not be less than 5 ft.	⅙ times diameter of tank but need not exceed 30 ft.
	Protection for exposures.	Diameter of tank but need not exceed 175 ft.	⅓ times diameter of tank but need not exceed 60 ft.
	None	2 times diameter of tank but need not exceed 350 ft.	⅓ times diameter of tank but need not exceed 60 ft.
Horizontal and vertical, with emergency relief venting to limit pressures to 2.5 p.s.i.g.	Approved interting system on the tank or approved foam system on vertical tanks.	½ times Table H-9 but shall not be less than 5 ft.	½ times Table H-9.
	Protection for exposures.	Table H-9	Table H-9.
	None	2 times Table H-9	Table H-9.

TABLE H-6

Type of tank	Protection	Minimum distance in feet from property line which may be built upon, including the opposite side of a public way	Minimum distance in feet from nearest side of any public way or from nearest important building
Any type	Protection for exposures.	1½ times Table H-9 but shall not be less than 25 ft.	1½ times Table H-9 but shall not be less than 25 ft.
	None	3 times Table H-9 but shall not be less than 50 ft.	1½ times Table H-9 but shall not be less than 25 ft.

TABLE H-7

Type of tank	Protection	Minimum distance in feet from property line which may be built upon, including the opposite side of a public way	Minimum distance in feet from nearest side of any public way or from nearest important building
Floating roof	Protection for exposures.	Diameter of tank but need not exceed 175 ft.	⅓ times diameter of tank but need not exceed 60 ft.
	None	2 times diameter of tank but need not exceed 350 ft.	⅓ times diameter of tank but need not exceed 60 ft.
Fixed roof	Approved foam or interting system.	Diameter of tank but need not exceed 175 ft.	⅓ times diameter of tank but need not exceed 60 ft.
	Protection for exposures.	2 times diameter of tank but need not exceed 350 ft.	⅔ times diameter of tank but need not exceed 120 ft.
	None	4 times diameter of tank but need not exceed 350 ft.	⅔ times diameter of tank but need not exceed 120 ft.

HAZARDOUS MATERIALS (cont.)

TABLE H-8

Type of tank	Protection	Minimum distance in feet from property line which may be built upon, including the opposite side of a public way	Minimum distance in feet from nearest side of any public way or from nearest important building
Horizontal and vertical tanks with emergency relief venting to permit pressure not in excess of 2.5 p.s.i.g.	Tank protected with any one of the following: Approved water spray, approved inerting, approved insulation and refrigeration, approved barricade.	See Table H-9, but the distance may be not less than 25 ft.	Not less than 25 ft.
	Protection for exposures	2½ times Table H-9 but not less than 50 ft.	Not less than 50 ft.
	None	5 times Table H-9 but not less than 100 ft.	Not less than 100 ft.
Horizontal and vertical tanks with emergency relief venting to permit pressure over 2.5 p.s.i.g.	Tank protected with any one of the following: Approved water spray, approved inerting, approved insulation and refrigeration, approved barricade.	2 times Table H-9 but not less than 50 ft.	Not less than 50 ft.
	Protection for exposures	4 times Table H-9 but not less than 100 ft.	Not less than 100 ft.
	None	8 times Table H-9 but not less than 150 ft.	Not less than 150 ft.

TABLE H-9

Capacity tank gallons	Minimum distance in feet from property line which may be built upon, including the opposite side of a public way	Minimum distance in feet from nearest side of any public way or from nearest important building
275 or less	5	5
276 to 750	10	5
751 to 12,000	15	5
12,001 to 30,000	20	5
30,001 to 50,000	30	10
50,001 to 100,000	50	15
100,001 to 500,000	80	25
500,001 to 1,000,000	100	35
1,000,001 to 2,000,000	135	45
2,000,001 to 3,000,000	165	55
3,000,001 or more	175	60

HAZARDOUS MATERIALS (cont.)

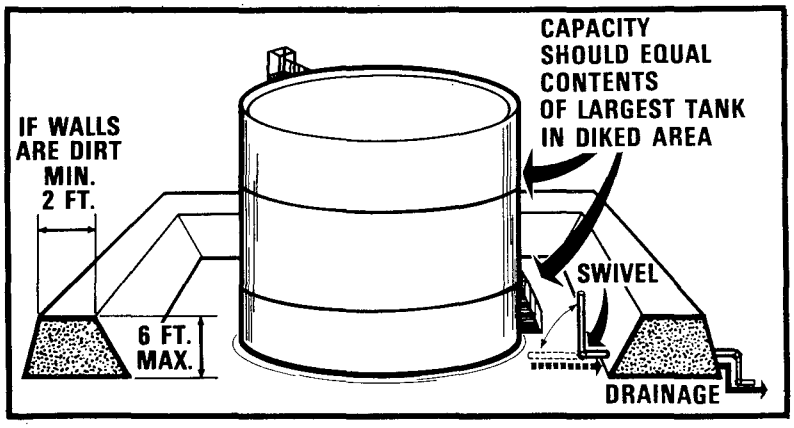
TANK VENTING

Normal venting of aboveground tanks is intended to prevent the development of a vacuum or pressure during filling and emptying, and vents must be sized accordingly. The American Petroleum Institute's Standard 2000 (1968) "Venting Atmospheric and Low Pressure Storage Tanks" may be helpful as a guide to determine the venting requirements for your tanks.

Emergency relief venting for fire hazards is intended to relieve excessive internal pressure caused by fires. This relief venting may be a floating roof, lifter roof, a weak roof-to-shell seam, or other approved pressure relieving devices.

DRAINAGE AND DIKING

The area surrounding a tank or group of tanks must be provided with either drainage or diking to prevent accidental discharge of liquid from endangering adjoining property or reaching waterways.



If drainage is used:

The slope must be not less than one percent.

The drainage path and destination must be located so that if the escaping liquids were ignited the fire will not seriously expose tanks or adjoining property.

The impoundment area must be large enough to accommodate the volume of the largest tank contained.

If diking is the method employed:

The capacity of the diked area must be large enough to contain the contents of the largest tank in the diked area.

The dike walls may not be more than 6 feet average height above the interior grade. If they are made of dirt, they must have a flat section at the top at least 2 feet wide if the walls are 3 feet or more in height.

No loose combustible material or drums are permitted in the diked area.

Control of the drainage of the diked area must be accessible during fire conditions.

UNDERGROUND STORAGE TANKS

Underground storage tanks must be covered with a minimum of 2 feet of earth, or 1 foot of earth and a slab of reinforced concrete at least 4 inches thick. Where underground tanks are subject to traffic, they must be covered by at least 3 feet of earth plus 6 inches of reinforced concrete, or 8 inches of asphaltic concrete.

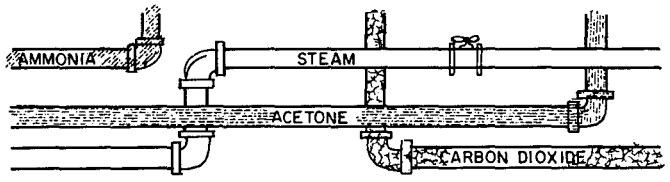
Underground storage tanks have specific venting requirements for Class I liquids. Vent pipes must be placed so that the point of discharge is outside all buildings. The vent pipe must be higher than the fill pipe opening, and not less than

12 feet above the surrounding ground level. Vent pipes must not be located where vapors can enter buildings or be captured under eaves or other obstructions.

PUMPING AND PIPING SYSTEMS

A closed piping system is the safest method for moving quantities of flammable liquids. However, serious accidents can take place even with a closed system, through the escape of liquids or vapors from faulty design or inadequate maintenance.

Pump motors 18 inches or less from the ground, and within 10 feet of piping, meters, and withdrawal fittings must be enclosed or explosion-proof. Motors must be grounded. Separate pipelines and pumps must be maintained for each class of product. Color coding and labeling the pumps and manifold eliminates confusion and prevents mistakes.



Color-coded and labeled piping

HAZARDOUS MATERIALS (cont.)

ENTRY TO CONFINED SPACES

Tank Entry and Cleaning

The following general rules apply whenever employees must enter vats, tanks, or other confined spaces:

Completely drain the tank of all contents.

Flush the tank thoroughly by filling with water, and if necessary hose down with steam.

Close and lock out all valves leading to the tank.

Forced air ventilation is usually required, and should preferably be applied from the bottom.

Test for the presence of toxic gases or explosive atmosphere.

Test for sufficient oxygen.

Only when it has been determined that the atmosphere within the tank is free of toxic or explosive gases and contains sufficient oxygen, the listed procedures should be followed for tank entry:

Written permission to enter the tank must be obtained from the supervisor and posted at the entrance to the tank.

All electrical equipment, belt drives, mixers, and agitators connected to the tank must be locked out.

Forced air ventilation must be applied through the tank.

The person entering the tank must be equipped with a safety harness and lifeline, a supplied-air respirator (if needed), and other necessary personal protective equipment.

There must be a stand-by person present, equipped

with a self-contained respirator, who is familiar with emergency procedures.

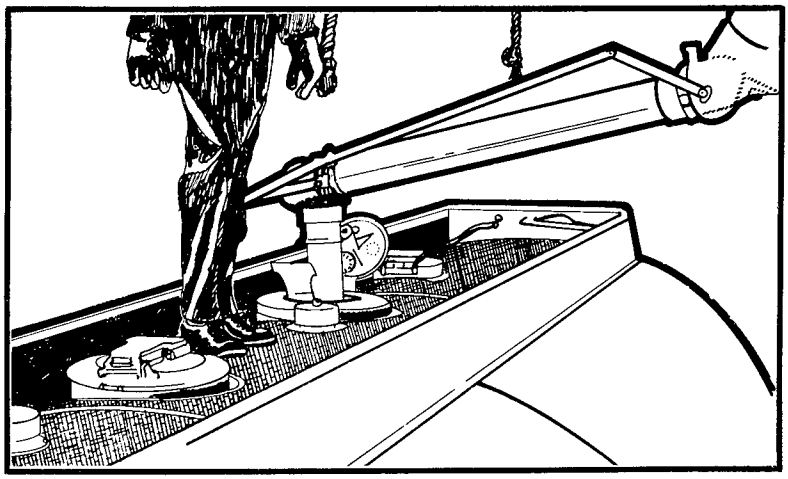
The worker in the tank must be visible to the stand-by person at all times.

All employees who either enter confined spaces or serve as stand-by workers must be thoroughly trained in the standard entry procedures as well as emergency procedures.

HAZARDOUS MATERIALS (cont.)

TANK CAR LOADING AND UNLOADING

A tank truck being loaded or unloaded must have the engine shut off, the brakes set, lights off, and bonding connection in place before the dome cover is removed.



Smoking must be prohibited within 20 feet of the rack in any direction where Class I or Class II liquids are handled. The entire loading area must be posted "NO SMOKING" where hazards from flammable liquids are present. The loading area of flammable liquids constitutes a Class I location and certain requirements for electrical equipment and connections apply.

Spills or overflows during loading or unloading should be avoided. If a spill does occur, loading should be stopped, valves shut off, and the spill cleaned up before loading is resumed. The flammable vapors should be allowed to dissipate before the truck engine is restarted.

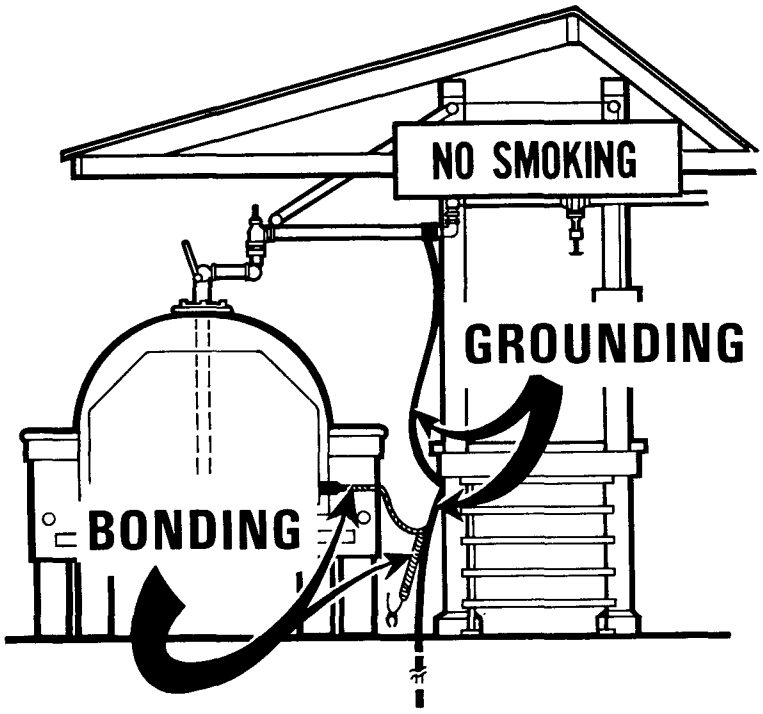
Carbon dioxide, foam, or dry chemical extinguishers must be available in the immediate loading area.

The loading rack surface and stairs must be of a slip-resistant material. Where the loading platform is over 4 feet

from the ground, guard rails must be used except where such railings would interfere with normal procedures. The rack area must be separated from bulk storage areas, warehouses, plant buildings, and occupied areas.

Piping, pumps, and meters used for the transfer of Class I liquids must not be used for the transfer of Class II or III liquids. Valves used for filling tank trucks must be of the self-closing type, except where there is an automatic shutoff control.

Bonding facilities for static protection are required during the loading of Class I liquids, or where Class II or III liquids are transferred into tanks which formerly contained Class I liquids. Where Class I liquids are not handled, or where vehicles are loaded through closed bottom or top connections, static bonding is not required.



PERSONAL PROTECTIVE EQUIPMENT

Chemical burns, skin rashes, and dermatitis constitute over half of all occupational health problems. It is imperative that proper personal protective clothing be used and maintained to prevent exposure to substances which are skin irritants. Personal protective equipment is also required whenever toxic substances or physical agents can do bodily harm through absorption, inhalation, or physical contact. The equipment must be safely designed and be well constructed so as to provide the protection for which it is intended. It must be maintained in a sanitary and reliable condition. **Personal protective equipment may not be used as a substitute for feasible engineering or administrative controls.**

EYE AND FACE PROTECTION

Eye and face protection is required where there is a reasonable potential for injury that can be prevented by its use, e.g., in areas where toxic or caustic substances might spray or splash. This equipment must be designed to provide adequate protection against the particular hazards to which the employee is exposed. The equipment must be easy to clean and also capable of being disinfected.

If eye and face protection must be worn by persons whose vision requires corrective lenses, goggles must be of the type that can be worn over glasses, or be constructed so that corrective lenses can be mounted behind the protective shield.

HEAD PROTECTION

Protective helmets which meet the requirements of the American National Standard Institute's Standard Z89.1, are required wherever workers may be subjected to impact or penetration from falling or flying objects.

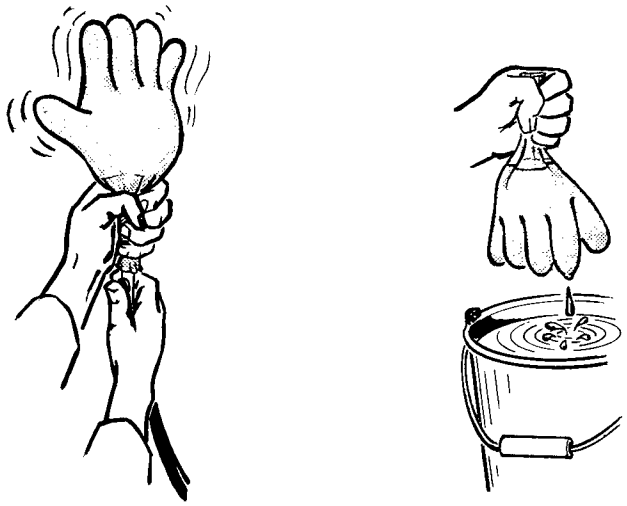
PERSONAL PROTECTIVE EQUIPMENT (cont.)

HEARING PROTECTION

Wherever noise levels are in excess of the allowable limits, employees must be provided and required to wear hearing protection. The use of hearing protection is appropriate only when engineering controls to reduce the noise level are not feasible, or when the noise-producing operation is of an intermittent nature.

HAND PROTECTION

When handling toxic liquids or particulates (dusty powders or granules) employees must wear gloves which are impervious to such substances. The gloves should be long enough to protect the forearms. Care must be taken to keep impervious gloves sanitary to prevent dermatitis. Gloves must be inspected frequently for pinholes and discarded when holes are found. Disposable cotton inner liners and hand lotions add further protection. If glove liners are used, they should be changed at least as often as protective clothing is changed.



Glove testing with airline or water

PERSONAL PROTECTIVE EQUIPMENT (cont.)

FOOT PROTECTION

Foot protection is required to prevent injury from falling or rolling objects, particularly during receiving and transferring inventory. In wet-process areas, non-skid footwear is required.

Where hazardous liquids are handled, footwear must be impervious to such liquids. Both uppers and soles of leather footwear may retain liquid pesticides, resulting in skin contact at an area of high absorption.

RESPIRATORY PROTECTION

NIOSH-approved respirators must be provided by the employer when the workplace air is contaminated with excessive concentrations of harmful dusts, fumes, mists, gases, or vapors. Respirators may be used as a control only when engineering or administrative controls are not feasible, or while they are being implemented.

If respirators are used, a written respirator program must be established and must include the following requirements:

The respirators selected for use must be designed to protect against the specific hazards to which employees are exposed.

Written instructions on the selection and use of respirators must be available. A record of persons issued respirators must be maintained.

Employees must be trained in the use and limitations of respirators and in their proper fitting and maintenance.

Respirators should be cleaned at the end of each use. They should be taken apart, washed, dried, and defective parts replaced.

If a respirator is used by two people, it must be cleaned and disinfected after each use.

When the respirator is worn, all straps must be adjusted and tied.

To ensure proper function of the respirator, a good face seal is necessary. Beards, long sideburns, and glasses may interfere with the fit.

Filters used in dust respirators should be replaced when breathing becomes difficult or, preferably, at the end of each workshift. Cartridges used in chemical cartridge respirators should be replaced at the expiration of the

RESPIRATORY PROTECTION (cont.)

lifetime of the cartridge, or when breathing becomes difficult, or the employee can smell vapors in the mask, whichever comes first.

Respirator requirements vary, depending on the chemical composition of the particular pesticide being formulated, The NIOSH Standards Completion Program "Guidelines" suggest the proper respirators to use for exposure to particular chemicals. Contact the NIOSH or OSHA Regional Office nearest you for information on respirator selection guidelines and use requirements.

SANITATION

Safe drinking water must be provided in all places of employment. The use of a common drinking cup is forbidden.

Receptacles for waste food must be covered and kept in a clean and sanitary condition.

Restrooms must be kept in a clean and sanitary condition.

Separate toilet facilities must be provided for each sex. If only one person at a time uses a toilet room and the door can be locked from the inside, separate facilities are not required.

One toilet and one lavatory must be provided for approximately every 15 employees.

Each lavatory must have hot and cold or tepid running water, hand soap, and individual hand towels or warm air blowers.

Beverages or food must not be stored or consumed in a toilet room or **in any area exposed to toxic materials.** Employees working with toxic substances should wash and, when necessary, change from contaminated clothing before eating, drinking, or smoking.

MEDICAL AND FIRST AID

The employer who is interested in maintaining production, preventing loss of work time, receiving efficient employee performance, and achieving good morale will adopt ways of preserving employees' health.

In the pesticide formulation industry, preplacement medical examinations are strongly recommended. This not only aids in determining employee ability to perform specific work, but forms the basis of a medical monitoring program—a valuable aid in determining the onset of health problems caused by exposure to pesticides.

Suggested periodic medical and biological monitoring requirements as well as preplacement medical examination tests have been listed as part of the Standards Completion Program. The employer is urged to contact the nearest NIOSH office to obtain information on a particular pesticide.

If you formulate, produce, or process pesticides local doctors, hospitals, and emergency treatment centers should be informed of your operation(s). The nature of the chemicals used should be well defined, so that the medical facilities can obtain specific antidotes, be familiar with symptoms of and emergency treatment for pesticide poisoning, and watch for cases of poisoning. Medical personnel should be informed of the information contained in the Standards Completion Program's "Guidelines."

In the absence of an infirmary, clinic, or hospital (in near proximity to the workplace) which is used for treatment of all injured employees, the following are required:

At least one and preferably more employees on each shift must be adequately trained to render first aid. First aid is immediate, temporary treatment given in the event of accident or illness—before the doctor arrives. Immediate first aid (within 4 minutes) may be the difference between complete recovery, permanent impairment, or death. The

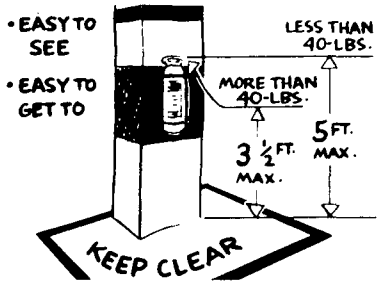
American Red Cross, the U.S. Bureau of Mines, some insurance carriers, local safety councils, and others provide acceptable training. Some states have laws concerning medical practice which establish limits on first aid given by the lay person. Trained employees should understand where first aid ends and treatment by a physician begins.

First aid supplies approved by a consulting physician must be readily available. The supplies should be in sanitary containers with individually sealed packages for material such as gauze, bandages, and dressings that must be sterile. Other items often needed are adhesive tape, triangular bandages (to be used as slings), inflatable plastic splints, scissors, and mild soap for cleansing of wounds or cuts. (See the chart in the back of this book for specific antidotes.)

Suitable facilities for quick drenching or flushing the eyes and body must be provided within the work area when a person may be exposed to either corrosive materials, or those which are readily absorbed through the skin and potentials for systemic poisoning.

NOTE: Do not send a worker believed to have pesticide poisoning to the doctor — take him or her.

FIRE EXTINGUISHERS



Fire extinguishers must meet the following requirements:

Be kept fully charged and in their designated places.

Be located along normal paths of travel.

Not be obstructed or obscured from view.

Not be mounted higher than 5 feet (to the top of the extinguisher) if 40 pounds or less. If heavier than 40 pounds, they must not be mounted higher than 3½ feet.

Be inspected by management or a designated employee at least monthly to insure that they: are in their designated places, have not been tampered with or actuated, and do not have corrosion or other impairments.

Be examined at least yearly and/or recharged or repaired to insure operability and safety. A tag must be attached to show the maintenance or recharge date and signature or initials of the person performing the service.

Be hydrostatically tested. Extinguisher sales representatives usually will perform this service at appropriate intervals.

Be selected on the basis of type of hazard, degree of hazard, and area to be protected.

Be placed so that the maximum travel distances, unless there are extremely hazardous conditions, do not exceed 75 feet for Class A or 50 feet for Class B.

A chart showing fire extinguishers by class, and how to use them, is located in the back of this booklet.

MATERIALS HANDLING AND STORAGE

GENERAL

The storage of materials must not, of itself, create a hazard. Materials stored in tiers (bags, containers, bundles, pallets, drums) must be stacked, strapped, blocked, or interlocked and limited in height so that they are stable and secure against sliding or collapse. Stored material must not obstruct fire extinguishers, alarm boxes, sprinkler system controls, electrical switch boxes, emergency lighting, first aid or emergency equipment, or exits. Storage racks must have sufficient capacity to bear the loads imposed on them.

Aisles in the storage areas must be kept free of obstructions and sufficient clearance maintained for foot and vehicular traffic. Where limited clearance exists (e.g., low overhead clearance), the clearance limit warning signs must be posted. Proper drainage must be maintained throughout the storage area. Material may not be stored in the aisles.

Flammable and combustible material stored in piles must have dunnage to separate the drums and provide stability.

All containers must be kept closed, and drums sealed. If any leakage occurs, the damaged container must be removed and any resultant fire or slipping hazard eliminated.

One way to minimize exposure to toxic substances during materials handling is to enclose the drum or bag dumping stations on mixing tanks or vessels.

MATERIALS HANDLING AND STORAGE (cont.)

Pesticides or other toxic material should not be stored with non-toxic materials, especially near foods. Containers must be labeled, and pesticides should be kept only in the original containers.

HYDRAULIC LIFT TRUCKS AND HAND TRUCKS

A hydraulic lift truck that leaks must be taken out of service until it has been repaired. The leaking can cause the truck to settle after the load has been raised.

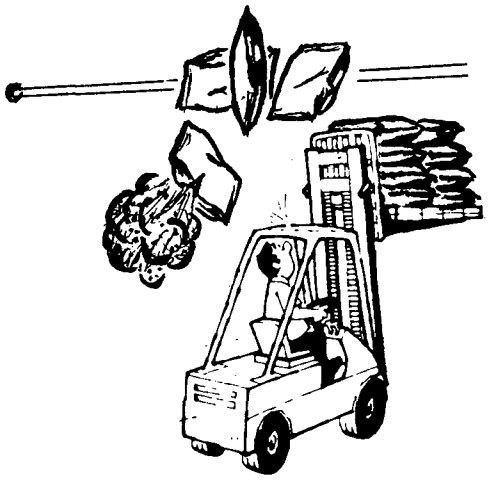
Operators of hand trucks should wear gloves and safety shoes. Knuckle guards installed on the handles will prevent jamming the hands into obstructions.

POWERED INDUSTRIAL TRUCKS

Powered industrial trucks are classified into categories for the purpose of determining what type of truck may be used in a certain location. The type of hazard in a location determines whether diesel, electric, gasoline, or LP-gas powered trucks may be used and what additional safeguards must be present. Suppliers can assist in the proper selection.

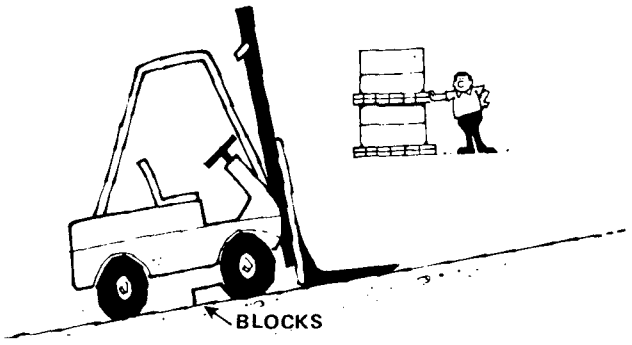
High-lift rider trucks must be fitted with an overhead guard to protect the operator from falling objects.

MATERIALS HANDLING AND STORAGE (cont.)



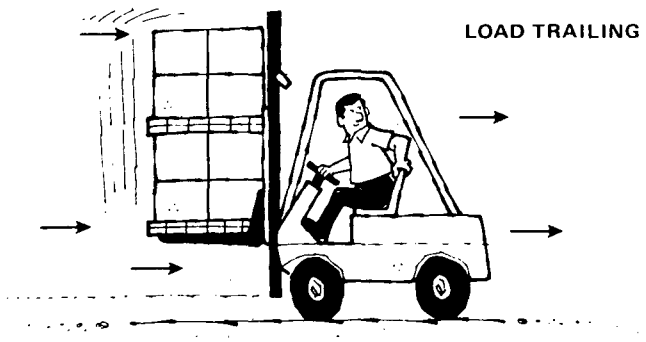
Methods must be developed and used to effectively train operators in the safe operation of powered industrial trucks, and only trained and authorized employees may operate the truck. Truck manufacturers and suppliers may provide training courses.

MATERIALS HANDLING AND STORAGE (cont.)



When a powered industrial truck is left unattended (operator 25 feet or more away or the truck is not in view), the forks must be fully lowered, the control lever positioned in neutral, the power shut off, and the brakes set. The wheels must be blocked if parked on an incline.

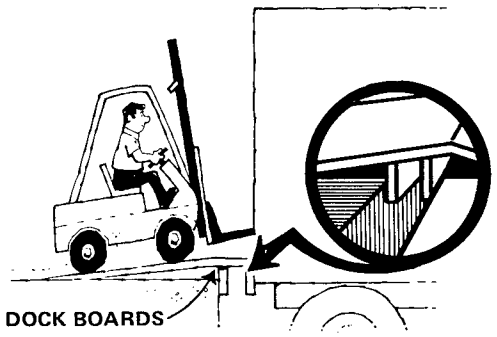
Industrial trucks must be examined daily for any conditions adversely affecting the safety of the vehicle before being placed into service. If the truck is used around the clock, it must be inspected after each shift.



MATERIALS HANDLING AND STORAGE (cont.)

If the load being carried obstructs forward view, the operator is required to travel with the load trailing.

When unloading or loading from trucks, trailers, or railroad cars with forklift trucks, provision must be made for securing the truck, trailer, or railroad car by setting the brakes and placing wheel chocks under the rear wheels. Portable dock boards must be secured in position with devices which will prevent their slipping during loading and unloading.



PORTABLE DOCK BOARDS

If battery-operated equipment is used, the battery charging area is to be designated with a "NO SMOKING" sign due to the hydrogen gas emitted during the charging process. The battery charging area must be well ventilated, and preferably set apart from operating areas. If there is any mixing of electrolyte solutions, the acid must be poured into water, not water into acid.

MACHINERY AND MACHINE GUARDING

GENERAL REQUIREMENTS FOR MACHINE GUARDING

One or more methods of machine guarding must be provided to protect the operator and other employees in the machine areas from hazards such as those created by point of operation, in-running nip points, rotating parts, flying chips, and sparks. All such hazards located 7 feet or less above the ground, floor, or working platform, must be guarded to prevent accidental contact. Guards must be attached to the machine if possible, or secured elsewhere if attachment to the machine is not possible. The guard must not offer an accident hazard in itself. Machines designed for fixed locations must be securely anchored to prevent "walking" or tipping.

A booklet entitled "The Principles and Techniques of Mechanical Guarding," OSHA 2057, can be obtained by writing to OSHA Regional Offices listed in the back of this book.

The most common methods of guarding a hazard or hazardous machine operation are:

enclosing the operation (preferred)
interlocking devices
moving barriers
removal devices
remote control
two-hand tripping devices
electronic safety devices.

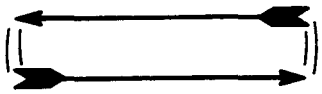
The following pages contain examples of specific equipment that must be guarded. This listing is not intended to include all equipment that may require guarding nor are the guarding methods suggested the only ones that may be effective.

MACHINERY AND MACHINE GUARDING (cont.)

ROTATING AND RECIPROCATING MOTION

Collars, couplings, cams, clutches, flywheels, shaft ends, spindles, rotating bar stock, lead screws, and horizontal or vertical shafting are typical examples of common rotating mechanisms which are hazardous. The danger increases when bolts, oil cups, nicks, abrasions, and projecting keys or screw threads are exposed when rotating.

Transverse (in straight line).

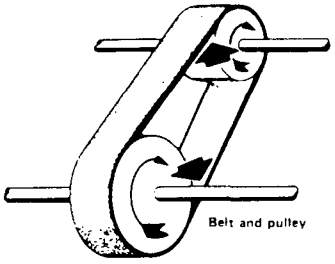


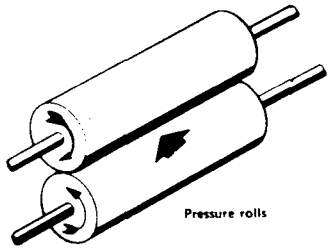
Reciprocating.

Rotating.

IN-RUNNING NIP POINTS

In-running nip points are created whenever machine parts rotate toward each other or where one rotates toward a stationary object. Objects or parts of the body may be drawn into this nip point and be bruised or crushed.

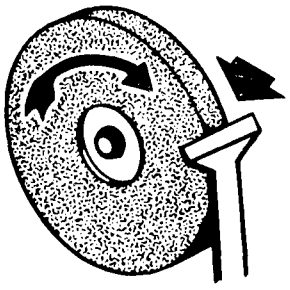




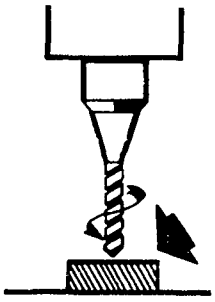
MACHINERY AND MACHINE GUARDING (cont.)

CUTTING ACTIONS

Cutting action results when rotating, reciprocating, or transverse motion is imparted to a tool so that the material removed is in the form of chips. The hazard of cutting action exists at the movable edge of the machine as it comes in contact with the material being cut. Typical examples of cutting action are band and circular saws, milling machines, planing and shaping machines, turning machines, boring or drilling machines, and grinding machines.



Abrasive wheel



Drill

GRINDERS

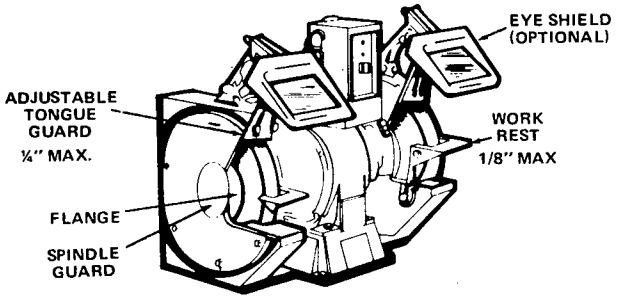
Wheel safety guards must cover the spindle end, nut, and flange projections. The exposed area of the grinding wheel should not exceed more than one-fourth of the area of the entire wheel. When the guard opening is measured, the visors and other accessory equipment are not included as part of the guard unless they are as strong as the guard.

Work or tool rests must be of strong construction and must be adjustable to compensate for wheel wear. Work rests must be kept closely adjusted to the wheel to prevent the work from becoming jammed between the wheel and the work rest. The maximum clearance allowed is 1/8-inch.

Tongue guards (upper peripheral guards) must be constructed

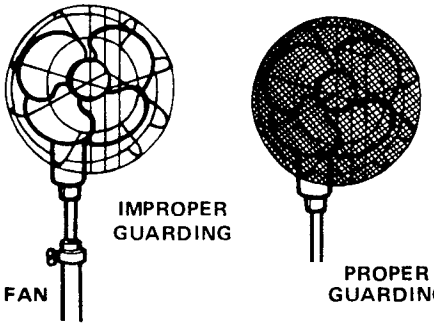
so that they adjust to the wheel as it wears down. A maximum clearance of ¼-inch is allowed between the wheel and the tongue guard.

Goggles or a face shield must be worn by grinder operators.

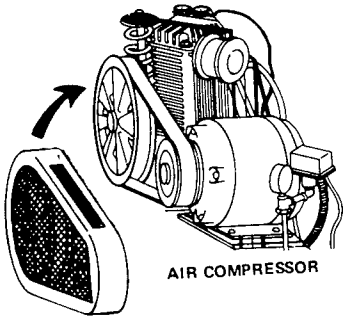


FANS

If fans are located within 7 feet of the floor, they must be guarded with grille or mesh, limiting openings to not more than ½-inch (least dimension).



AIR COMPRESSORS



The pulleys and drive belts of air compressors must be fully enclosed.

HAND AND PORTABLE POWERED TOOLS

The following is a partial list of regulations governing use of hand tools.

Each employer is responsible for the safe condition of tools and equipment used by employees, including tools and equipment which may be furnished by employees.

Hammers with broken or cracked handles, chisels and punches with mushroomed heads, and bent or broken wrenches should not be used.

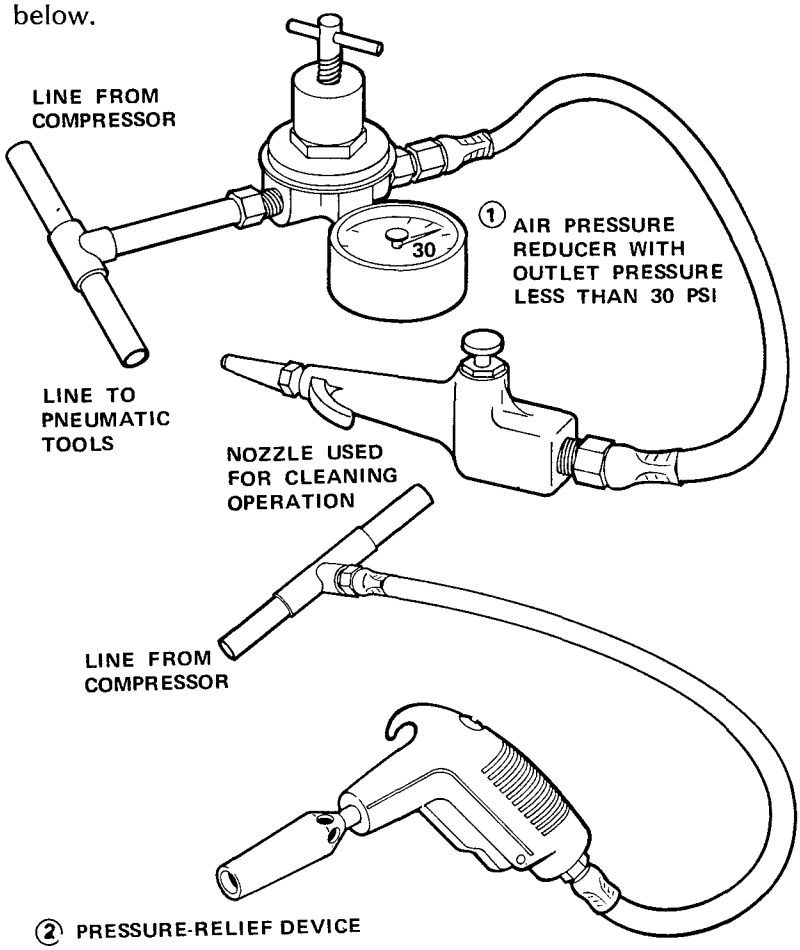
Most hand-held powered tools must be equipped with a dead-man control so that the power is automatically shut off whenever the operator releases the control.

Portable circular saws must be equipped with guards above and below the base plate or shoe. The lower guard must retract when the blade is in use, and automatically return when the tool is withdrawn from the work.

All hand-held portable electrical equipment must have the frame grounded by means of a separate ground wire or be double-insulated and identified as such.

HAND AND PORTABLE POWERED TOOLS (cont.)

Beware of compressed air, it can be dangerous. Alternative methods of cleaning surfaces should be sought. Compressed air should never be used to blow debris from a person. The downstream pressure of compressed air must remain at a pressure level below 30 psi whenever the nozzle is dead-ended and then only when effective chip guarding and personal protective equipment are used. Two acceptable methods of meeting the 30 psi requirement are as illustrated below.



WELDING, CUTTING, AND BRAZING

GENERAL

Management must establish areas for cutting and welding operations based on the fire potentials of the plant. Special procedures must be established for welding and cutting in high hazard locations. Preferably, cutting or welding should be done in an area with no surrounding combustible material. If combustibles in the immediate vicinity are unavoidable, guards must be used to protect against the fire hazards from heat and sparks. Suitable fire extinguishing equipment (pails of water, buckets of sand, hose, or portable extinguisher) must be maintained for instant use.

Torch cutters and welders must be suitably trained in the safe operation of their equipment. Printed rules and instructions (supplied by the manufacturers) covering operation of equipment must be strictly enforced.

WELDING, CUTTING, AND BRAZING (cont.)

No welding, cutting, or other hot work may be performed on used drums, barrels, tanks, or other containers until they have been thoroughly cleaned so as to make certain that there are no flammable materials present or any substances such as greases, tars, acids, or other materials which, when subjected to heat, might produce flammable or toxic vapors. The atmosphere in the welding area must be free of flammable gases, liquids, and vapors.

Goggles or other suitable eye protection (helmets, hand shields) must be used during welding or cutting operations as a protection against sparks and debris.

Employees adjacent to the welding areas must be protected from ultraviolet rays by noncombustible or flameproof screens or shields, or they must be required to wear appropriate goggles.

Employees exposed to hazards created by cutting and welding must be protected by personal protective equipment. For example:

- Flameproof gauntlet gloves (except for light work) should be worn.
- Flameproof aprons (leather for example) or jackets may be needed as protection against sparks and radiant heat.
- Fire resistant leggings or high boots should be worn.

The potential health hazard to a welder or cutter from gases or metal fumes depends on the toxicity of the materials involved (types of metals, fluxes, coatings, etc.), the duration of exposure, and ventilation.

There are specific requirements concerning ventilation and respirators when welding or cutting is performed on the following:

WELDING, CUTTING, AND BRAZING (cont.)

stainless steel, lead, zinc, or cadmium

metals coated with lead or mercury-containing materials such as paint

fluxes or other materials containing fluorides.

REQUIREMENTS FOR VENTILATION AND RESPIRATORS WHEN WELDING OR CUTTING

Welding or Cutting on Materials Containing or Coated With	*Location of Operation*		
	Confined Spaces	*Indoors*	*Outdoors*
Lead	A	B	E
Zinc	A	B	
Fluorine	A	C	C
Cadmium	C	C	F
Beryllium	D	D	D
Mercury	C	C	F

Stainless Steel = mechanical ventilation adequate to remove the fumes generated.

A = Adequate ventilation to prevent the accumulation of toxic materials or possible oxygen deficiency. Where it is impossible to provide such ventilation approved airline respirators must be used.

B = Mechanical local exhaust by means of hoods or booths with sufficient airflow to maintain a velocity, away from the worker, of at least 100 linear feet per minute.

C = If conditions warrant, mechanical local exhaust (B) *or* approved airline respirators.

D = If conditions warrant, mechanical local exhaust (B) *and* approved airline respirators.

E = Approved respirators.

F = If conditions warrant, approved respirators (E).

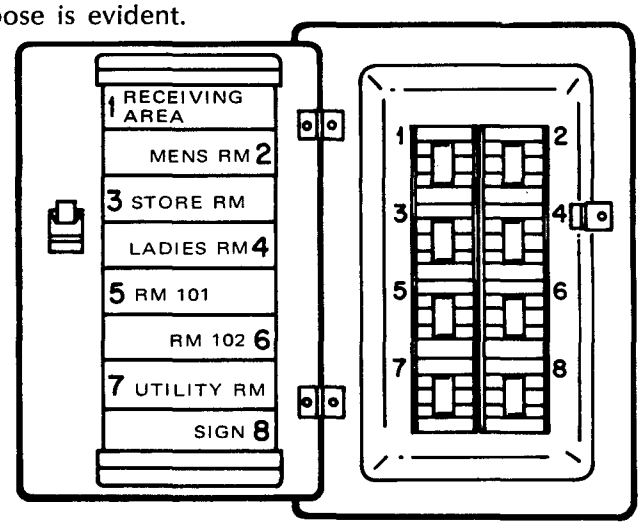
THE NATIONAL ELECTRICAL CODE (NEC)

ELECTRICAL REQUIREMENTS

More fires are caused by electrical malfunction than any other cause, and standards pertaining to electrical equipment and its use in all industries have been cited as violations more frequently than any others.

The National Electrical Code, NFPA 70-1971, ANSI C1-1971, has been adopted as the electrical standard by OSHA (Refer to "Information Sources"). The purpose of the NEC is the safeguarding of persons, as well as buildings and their contents from electrical hazards. The code contains minimum provisions considered necessary for electrical safety. Employees doing electrical work should be familiar with the following requirements:

Each disconnecting means (e.g., circuit breaker or fuse box) must be legibly marked to indicate its purpose unless its purpose is evident.



Proper labeling of circuit breakers.

THE NATIONAL ELECTRICAL CODE (NEC) (cont.)

Frames of electrical motors, regardless of voltage, must be grounded.

Exposed noncurrent-carrying metal parts of fixed equipment that may become energized under abnormal conditions must be grounded under any of the following circumstances:

in wet or damp locations

if in electrical contact with metal

if operated in excess of 150 volts to ground

when in a hazardous location.

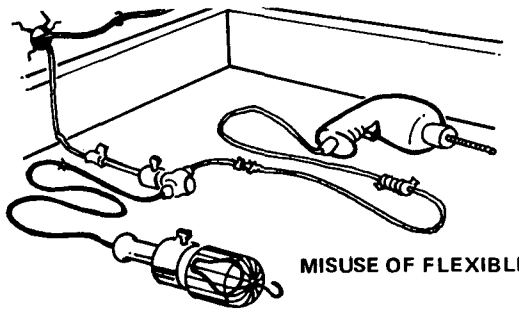
Exposed noncurrent-carrying metal parts of the following plug-connected equipment, which are liable to become energized, must be grounded or double-insulated and distinctly marked:

portable hand-held motor-operated tools

appliances

any equipment operated in excess of 150 volts to ground.

Outlets, switches, junction boxes, etc., must be covered and dust-tight in areas of high airborne dust concentrations or water-tight in wet locations.



MISUSE OF FLEXIBLE CORDS

THE NATIONAL ELECTRICAL CODE (NEC) (cont.)

Flexible cords may not be:

used as a substitute for fixed wiring

run through holes in walls, ceilings, or floors

run through doors, windows, etc.

attached to building surfaces.

Flexible cord must be fastened so that there is no pull on joints or terminal screws. It must be replaced when frayed or when the insulation has deteriorated.

All splices in flexible cord must be executed by brazing, welding, or soldering, or by joining the conductors with suitable splicing devices. Any splices, joints, and the free ends of conductors must be properly insulated.

RECORDKEEPING REQUIREMENTS

Recordkeeping requirements under OSHA compile factual information about accidents that have happened. These records provide employers with a measure for evaluating the success of their safety and health activities and of identifying high risk areas of their businesses to which attention should be directed. Employers must report within 48 hours to OSHA (or a state agency in states which have operational safety and health plans) any incident or accident which results in hospitalization of 5 or more employees or a fatality.

Federal regulations require employers with 11 or more employees at any time during the preceding calendar year to complete OSHA Forms 100, 101 (or equivalent), and 102. The following cases must be recorded on the OSHA Form 100 (Log of Occupational Injuries and Illnesses): every death, every illness, and any injury which results in loss of consciousness, loss of time, restriction of work or motion, temporary or permanent transfer to another job, or medical treatment other than first aid. Illnesses and injuries are classified by lost workdays, restriction of duties or "light duty," and no lost time.

A supplementary record must be completed for each recordable case. OSHA Form 101 may be used; a state workers' compensation report or other form is acceptable if it contains the equivalent information as the OSHA 101. Forms 100 and 101 must be kept current to within 6 days.

An annual summary, OSHA Form 102 must be posted for the entire month of February in a place where all employees are likely to see it. All of these forms (100, 101, and 102) must be retained for 5 years, excluding the current calendar year.

A booklet "Recordkeeping Requirements Under the Williams-Steiger Occupational Safety and Health Act of 1970" which provides a supply of forms and more detailed infor-

RECORDKEEPING REQUIREMENTS (cont.)

mation is available from OSHA regional or area offices or from the regional offices of the Bureau of Labor Statistics.

Employers are also required to maintain accurate records of certain potentially toxic or harmful physical agents which must be monitored or measured and to promptly advise employees of any excessive exposure and the corrective action taken. In certain cases, physical examinations and testing are required. Examples of these agents are asbestos, ionizing radiation, etc. Any NIOSH or OSHA office can advise you of these hazardous substances and explain what records may be required.

RECORDKEEPING REQUIREMENTS (cont.)

Employers must post one of the full size versions (10x16) of this type of OSHA poster or a state-approved poster where required.

job safety and health protection

The Occupational Safety and Health Act of 1970 provides job safety and health protection for workers through the promotion of safe and healthful working conditions throughout the Nation. Requirements of the Act include the following:

Employers: **Each employer shall furnish to each of his employees employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious harm to his employees; and shall comply with occupational safety and health standards issued under the Act.**

Employees: **Each employee shall comply with all occupational safety and health standards, rules, regulations and orders issued under the Act that apply to his own actions and conduct on the job.**

The Occupational Safety and Health Administration (OSHA) of the Department of Labor has the primary responsibility for administering the Act. OSHA issues occupational safety and health standards, and its Compliance Safety and Health Officers conduct jobsite inspections to ensure compliance with the Act.

Inspection: The Act requires that a representative of the employer and a representative authorized by the employees be given an opportunity to accompany the OSHA inspector for the purpose of aiding the inspection.

Where there is no authorized employee representative, the OSHA Compliance Officer must consult with a reasonable number of employees concerning safety and health conditions in the workplace.

Complaint: Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace. OSHA will withhold, on request, names of employees complaining.

The Act provides that employees may not be discharged or discriminated against in any way for filing safety and health complaints or otherwise exercising their rights under the Act.

An employee who believes he has been discriminated against may file a complaint with the nearest OSHA office within 30 days of the alleged discrimination.

Citation: If upon inspection OSHA believes an employer has violated the Act, a citation alleging such violations will be issued to the employer. Each citation will specify a time period within which the alleged violation must be corrected.

The OSHA citation must be prominently displayed at or near the place of alleged violation for three days, or until it is corrected, whichever is later, to warn employees of dangers that may exist there.

Proposed Penalty: The Act provides for mandatory penalties against employers of up to $1,000 for each serious violation and for optional penalties of up to $1,000 for each nonserious violation. Penalties of up to $1,000 per day may be proposed for failure to correct violations within the proposed time period. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to $10,000 for each such violation.

Criminal penalties are also provided for in the Act. Any willful violation resulting in death of an employee, upon conviction, is punishable by a fine of not more than $10,000 or by imprisonment for not more than six months, or by both. Conviction of an employer after a first conviction doubles these maximum penalties.

Voluntary Activity: While providing penalties for violations, the Act also encourages efforts by labor and management, before an OSHA inspection, to reduce injuries and illnesses arising out of employment.

More Information: **Additional information and copies of the Act, specific OSHA safety and health standards, and other applicable regulations may be obtained from the nearest OSHA Regional Office in the following locations:**

Atlanta, Georgia
Boston, Massachusetts
Chicago, Illinois
Dallas, Texas
Denver, Colorado
Kansas City, Missouri
New York, New York
Philadelphia, Pennsylvania
San Francisco, California
Seattle, Washington

Telephone numbers for these offices, and additional Area Office locations, are listed in the telephone directory under the United States Department of Labor in the United States Government listing.

Washington, D.C.
1974
OSHA 2203

Peter J. Brennan
Secretary of Labor

U.S. Department of Labor
Occupational Safety and Health Administration

CHECKLISTS

Since safe conditions depend on surveillance for possible hazards and immediate remedial action, periodic inspections are one of the most important aspects of a successful health and safety program.

Management will find a checklist, such as the one presented on the following pages, helpful in performing a self-inspection of its facility. Because businesses vary, it is best that each business develop a customized list from the information in this booklet and a walk-through inspection.

Using this checklist, the manager, supervisor, or employee representative makes periodic inspections (preferably at least once each month) to identify problem areas so that corrective action may be taken.

Reference made in the "Checklist" subtitles refers to appropriate sections of "General Industry Standards, Title 29 Code of Federal Regulations Part 1910."

WALKING AND WORKING SURFACES

AISLES AND FLOORS (29 CFR 1910.22)

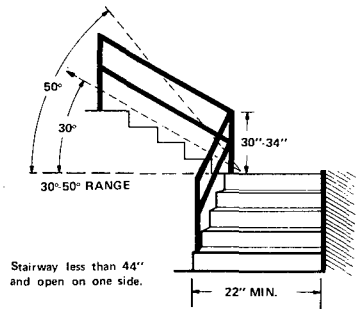
	Yes	No
Are all places of employment kept clean and orderly?	☐	☐
Are floors, aisles, and passageways kept clean and dry, and are spills cleaned up immediately?	☐	☐
Are floor holes, such as drains or mixers covered or guarded?	☐	☐
Are permanent aisles appropriately marked?	☐	☐
Are drains provided to remove water from floors?	☐	☐
Are signs showing floor load capacity present?	☐	☐
Are wet surface areas covered with non-slip materials?	☐	☐

STORAGE LOFTS, SECOND FLOORS, ETC. (29 CFR 1910.22, .23)

Are platforms, storage lofts, balconies, etc. that are more than 4 feet above the floor protected with standard guardrails?	☐	☐
Are all platforms, lofts, and balconies (above where people or machinery could be exposed to falling objects) guarded with standard 4 inch toeboards?	☐	☐

STAIRS (29 CFR 1910.24)

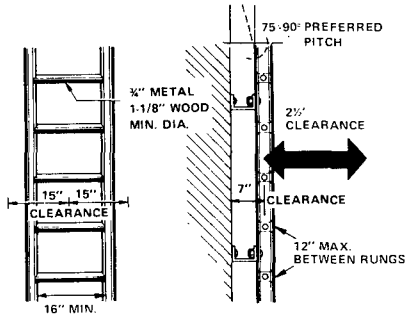
Are there standard stair rails or handrails on all stairways having four or more risers?	☐	☐
Are all stairways at least 22 inches wide?	☐	☐



	Yes	No
Do stairs have at least a 7 foot overhead clearance?	☐	☐
Do stairs angle no more than 50° and no less than 30°?	☐	☐

LADDERS (29 CFR 1910.25, .26, .27)

Have defective ladders (e.g., with broken rungs, side rails, etc.) been tagged as "DANGEROUS, DO NOT USE" and removed from service for repair or destruction?	☐	☐
Is the use of the top of an ordinary step ladder as a step prohibited?	☐	☐
Do fixed ladders have at least 3½ feet of extension at the top of the landing?	☐	☐



	Yes	No
Is the distance between the centerline of rungs on a fixed ladder and the nearest permanent object in back of the ladder at least 7 inches or more?	☐	☐
Do all fixed ladders have a preferred pitch of 75°-90°?	☐	☐

EGRESS (29 CFR 1910.36-.37)

Are all exits marked with an exit sign and illuminated by a reliable light source?	☐	☐
Is the lettering at least 6 inches high with the principal letter strokes at least ¾ of an inch wide?	☐	☐
Is the direction to exits, when not immediately apparent, marked with visible signs?	☐	☐
Are doors or other passageways, that are neither exits nor access to an exit, and located where they may be mistaken for exits, appropriately marked "NOT AN EXIT," "TO BASEMENT," "STOREROOM," etc.?	☐	☐
Are exit doors side-hinged?	☐	☐
Are all doors that must be passed through to reach an exit or way to an exit, always free to access with no possibility of a person being locked inside?	☐	☐
Are all exit routes always kept free of obstructions?	☐	☐

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL (29 CFR (1910.93,.94, .1000)

Is management aware of the hazards caused by various materials used in the plant?	☐	☐

	Yes	No
Is employee exposure to these chemicals kept within the acceptable levels?	☐	☐
Are eye wash fountains and safety showers provided in areas where chemicals that can be skin absorbed are used?	☐	☐
Are all containers, such as vats, storage tanks, etc. labeled as to their contents?	☐	☐
Is vacuuming used for cleanup wherever possible, rather than blowing or sweeping dust?	☐	☐
Are employees required to wear personal protective equipment when handling solvents, pesticides, caustics, etc. to avoid eye or skin contact?	☐	☐

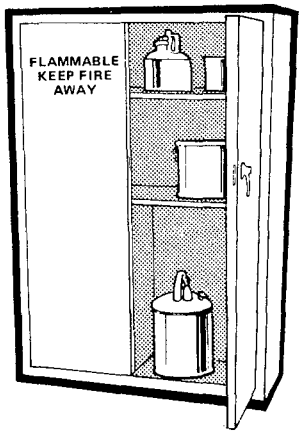
OCCUPATIONAL NOISE EXPOSURE (29 CFR 1910.95)

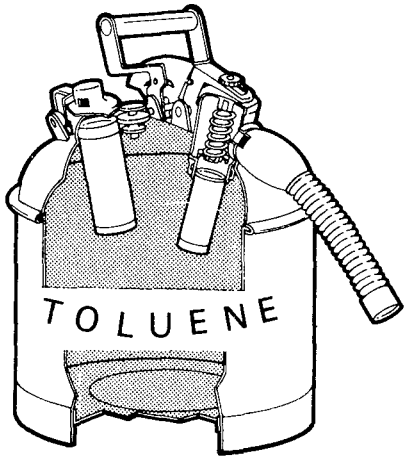
If a noise problem is suspected, have noise levels been accurately measured?	☐	☐
If a noise problem exists, have plans to reduce noise levels by engineering methods been implemented (e.g., enclosure, maintenance, different methods of processing)?	☐	☐
If engineering controls cannot reduce the noise to safe levels:		
Have administrative controls, such as limiting worker exposure in a given area, been started?	☐	☐
Are affected employees given annual audiometric tests, if necessary?	☐	☐
Do all employees in high noise areas wear hearing protection?	☐	☐

HAZARDOUS MATERIALS

FLAMMABLE AND COMBUSTIBLE LIQUIDS (29 CFR 1910.106)

	Yes	No
Are all connections on drums and combustible liquid piping systems vapor and liquid tight?	☐	☐
Are flammable liquids kept in closed containers when not in use (e.g., parts cleaning tanks, pans, etc.)	☐	☐
Are all spills of flammable and combustible liquids or liquid pesticides cleaned up promptly?	☐	☐
Are bulk drums of flammable liquids grounded and bonded to containers during dispensing?	☐	☐
Are gasoline and other flammable liquids stored in approved containers?	☐	☐





Do storage rooms for flammable and combustible liquids have explosion-proof lights?	☐	☐

	Yes	No
Do storage rooms for flammable and combustible liquids have mechanical or gravity ventilation (at least six air changes per hour)?	☐	☐
Are storage cabinets for flammable liquids labeled "FLAMMABLE-KEEP FIRE AWAY"?	☐	☐
Are storage areas for flammables prominently posted as a "NO SMOKING" area?	☐	☐
Are tank areas provided with either drainage or diking?	☐	☐
Is the volume of the diked area greater than the contents of the largest tank in the diked area?	☐	☐

UNDERGROUND TANKS

Is the vent pipe a minimum diameter of 1¼ inches?	☐	☐
Does the vent pipe extend at least 12 feet above grade?	☐	☐
Is the vent pipe located so vapors do not discharge inside buildings or become trapped under eaves, etc.?	☐	☐

LOADING RACKS

Are tank loading facilities separated by a minimum of 25 feet from aboveground tanks?	☐	☐
Are tank truck loading facilities separated by a minimum of 25 feet from warehouse and other buildings?	☐	☐
Are tank truck loading facilities separated by a minimum of 25 feet from nearest adjoining property which may be built upon?	☐	☐

	Yes	No
Are bonding cables at top loading facilities in good condition and used where Class I liquids are handled?	☐	☐
Does all electrical equipment in the area conform to the provisions of the National Electrical Code?	☐	☐

PERSONAL PROTECTIVE EQUIPMENT (29 CFR 1910.132-.137)

Is personal protective equipment provided, used, and maintained wherever it is necessary?	☐	☐
Is employee-owned personal protective equipment, such as gloves and protective shoes, adequate and properly maintained?	☐	☐
Is eye protection available and worn where chemical splashing could be a hazard?	☐	☐
Are ear plugs or muffs provided and worn during noisy conditions?	☐	☐
Is slip-resistant footwear impervious to liquids used in wet-process areas?	☐	☐

RESPIRATORY PROTECTION DEVICES (29 CFR 1910.134)

Are respirators provided and used when necessary?	☐	☐
Are there written standard operating procedures for the selection and use of respirators?	☐	☐
Is the user instructed and trained in the proper use of respirators?	☐	☐

	Yes	No
Where practicable, are respirators assigned for use by individual employees?	☐	☐
Are respirators cleaned and disinfected after use?	☐	☐
Are respirators stored in a convenient, clean, and sanitary location?	☐	☐
Are routinely-used respirators inspected during cleaning?	☐	☐
Is the proper respirator in use for the hazards present? (For example, dust masks do not protect against solvent vapors.)	☐	☐
Are respirators tested for effective fit at the time of their issue and at regular intervals?	☐	☐
Are respirators checked periodically to insure that they are in good operating condition?	☐	☐
Are filters or cartridges being changed at adequate intervals?	☐	☐

GENERAL ENVIRONMENTAL CONTROLS

SANITATION (29 CFR 1910.141)

Are restrooms and washrooms kept in clean and sanitary condition?	☐	☐
Are covered receptacles for waste food kept in clean and sanitary condition?	☐	☐

	Yes	No
Are all outlets for water that is not suitable for drinking, clearly posted as "UNSAFE FOR DRINKING, WASHING, OR COOKING"?	☐	☐
Are employees prohibited from eating in areas where toxic materials are present?	☐	☐
If employees are permitted to eat on the premises, are they provided with a suitable space for that purpose?	☐	☐
Do employees shower and put on clean clothes before going home?	☐	☐

MEDICAL AND FIRST AID (29 CFR 1910.151)

Are first aid supplies readily available, inspected, and replenished?	☐	☐
Is at least one employee on each shift currently qualified to render first aid in the absence of a nearby clinic or hospital? (Some states require first aid trained persons regardless of nearby clinics or hospitals.)	☐	☐
Are first aid supplies approved by a consulting physician, indicating that they are adequate?	☐	☐
Are medical personnel readily available for advice and consultation on matters of employee health?	☐	☐
Is there a first aid kit easily accessible to the work area?	☐	☐
Are emergency phone numbers posted?	☐	☐

	Yes	No
Where employees may be exposed to toxic or corrosive materials are they provided with quick-drenching and flushing facilities for immediate emergency use?	☐	☐
Has the employer obtained suggested medical monitoring requirements listed in the Standards Completion Program?	☐	☐

FIRE SUPPRESSION EQUIPMENT (29 CFR 1910.157-.161)

Are the extinguishers selected for the types of combustibles and flammables in the areas where they are to be used?		
Class A—Ordinary combustible material fires	☐	☐
Class B—Flammable liquid or grease fires	☐	☐
Class C—Energized electrical equipment fires	☐	☐
Are extinguishers fully charged and in designated places?	☐	☐
Are extinguishers located along normal paths of travel?	☐	☐
Are extinguisher locations free from obstruction or blockage?	☐	☐
Are extinguishers not mounted too high? If they weigh less than 40 pounds, the top not be higher than 5 feet above the floor; if they weigh more than 40 pounds, the top must not be higher than 3½ feet above the floor.	☐	☐
Have all extinguishers been serviced, maintained, and tagged at intervals not to exceed one year?	☐	☐

	Yes	No
Are all extinguishers checked (by management or designated employee) monthly to see if they are in place or if they have been discharged, etc.?	☐	☐

AUTOMATIC SPRINKLER (if applicable)

Is there at least one automatic water supply of adequate pressure, capacity, and reliability?	☐	☐
Is combustible material never piled within 36 inches of the sprinkler system except if in solid piles 15 feet high? In piles 12 feet high with horizontal channels an 18 inch clearance is permitted.	☐	☐
Are water-flow alarms provided on all sprinklers?	☐	☐
Are the sprinkler systems periodically inspected and continuously maintained?	☐	☐

DRY CHEMICAL SYSTEMS (if applicable)

Does a competent inspector make annual inpections and perform tests on all dry chemical systems?	☐	☐
Are the inspector's reports kept on file?	☐	☐
Are visual inspections regularly made?	☐	☐
Are all dry chemical systems maintained in full operating condition at all times?	☐	☐

COMPRESSED AIR (29 CFR 1910.169)

Are pulleys and belts on compressors and motors completely guarded?	☐	☐

	Yes	No
Are flexible cords or plugs on electric motors periodically checked and replaced if in a deteriorated condition?	☐	☐
Do the relief valves operate properly?	☐	☐
Are air tanks drained regularly?	☐	☐
Is the pressure relief device and gauge in good operating condition?	☐	☐

MATERIALS HANDLING AND STORAGE (29 CFR 1910.176-.181)

Is stored material stable and secured against sliding or collapsing?	☐	☐
Are storage areas free from tripping hazards?	☐	☐
Are racks and platforms loaded within the limits of their capacity?	☐	☐
Are specifications posted for maximum loads which are approved for floors (except slabs with no basements) or other structures?	☐	☐
Are containers of combustibles or flammables, when stacked one upon the other, always separated by dunnage sufficient to provide stability?	☐	☐
Have aisles been designated and kept clear to allow unhindered passage?	☐	☐
If motorized equipment, such as lift trucks, is used, are aisles permanently marked, providing sufficient clearance for passage of the equipment?	☐	☐

	Yes	No
Are only trained operators allowed to operate powered industrial trucks?	☐	☐
Are appropriate overhead guards installed on powered lift trucks?	☐	☐
Are dock boards (bridge plates) used when loading or unloading from dock to truck or dock to rail car?	☐	☐
Is battery charging on electric units performed only in designated areas?	☐	☐
Are "NO SMOKING" signs posted near electric battery charging units?	☐	☐
Are all vehicles shut off prior to loading?	☐	☐

MACHINERY AND MACHINE GUARDING (29 CFR 1910.212)

Are belts, pulleys, and rotating shafts properly guarded?	☐	☐
Are chains, sprockets and gears properly guarded?	☐	☐
Are all nip points properly guarded?	☐	☐
Are rotating shafts that are not smooth properly guarded?	☐	☐
Are all rotating parts recessed or covered with collars?	☐	☐
Are all pieces of equipment with an electric motor or any electrical connection effectively grounded?	☐	☐

	Yes	No
Are sprockets and belt drives within reach of platforms and passageways or less than 7 feet from the floor completely enclosed?	☐	☐
Are fans less than 7 feet above floor guarded, having openings ½ inch or less?	☐	☐

ABRASIVE WHEEL MACHINERY (Grinders) (29 CFR 1910.215)

Is the work rest used and kept adjusted to within ⅛ inch of wheel?	☐	☐
Is the adjustable tongue on top side of grinder used and kept adjusted to within ¼ inch of wheel?	☐	☐
Do side guards cover the spindle, nut, and flange, and 75% of the wheel diameter?	☐	☐
Are bench and pedestal grinders permanently mounted?	☐	☐
Are goggles or face shields always worn when grinding?	☐	☐

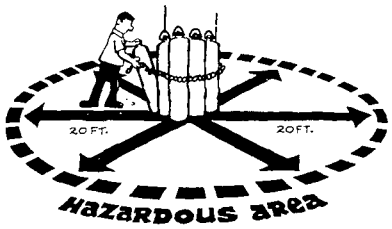
HAND AND PORTABLE POWER TOOLS (29 CFR 1910.242-.244)

Are tools and equipment (both company and employee-owned) in good condition?	☐	☐
Have worn or bent wrenches been replaced?	☐	☐
Have employees been instructed that the use of compressed air to blow debris from clothing or the body is prohibited because it can enter the body and cause serious harm?	☐	☐
Have deteriorated air hoses been replaced?	☐	☐

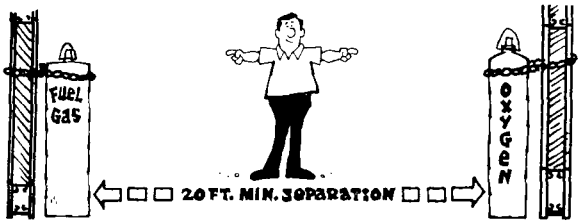
	Yes	No
Are nozzle pressures limited to 30 psi?	☐	☐
Have employees been made aware of the hazards caused by faulty or improperly used hand tools?	☐	☐

WELDING, CUTTING, AND BRAZING (29 CFR 1910.252)

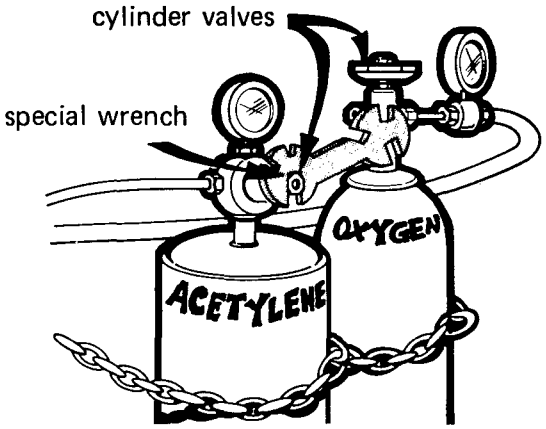
Are fuel gas cylinders and oxygen cylinders in storage separated by 20 feet or a barrier 5 feet high having a 1½-hour fire resistance rating?	☐	☐



Are cylinders secured and stored where they cannot be knocked over?	☐	☐
Are valve protection caps in place except when the cylinder is in use?	☐	☐
Are compressed gas cylinders kept away from sources of heat, elevators, stairs, or gangways?	☐	☐
Are only employees who are judged competent by the employer allowed to use oxygen or fuel gas equipment?	☐	☐



	Yes	No
Do all cylinders (except those with fixed hand wheels) have non-adjustable wrenches, keys, or handles in place on valve stems while they are in use?	☐	☐



Is welding or cutting always conducted at a safe distance from flammable liquids?	☐	☐
Are all compressed gas cylinders legibly marked to identify the contents?	☐	☐
Are the valves shut off when the cylinder is not in use?	☐	☐
Are precautions taken to be sure that barrels, tanks, or other containers have been cleaned thoroughly to remove all flammable vapors or residues before cutting, welding, or other hot work is performed on them?	☐	☐
Is eye protection (goggles, helmets, hand shields) provided and worn as a protection against sparks or other debris?	☐	☐
Is appropriate protective clothing (gloves, aprons, leggings, etc.) worn?	☐	☐

	Yes	No
Are nearby workers protected from welding flash?	☐	☐
Are employee exposures to cutting and welding fumes kept within acceptable limits?	☐	☐

NATIONAL ELECTRICAL CODE (1910.308-.309)

Have exposed wires, frayed cords, and deteriorated insulation been repaired or replaced?	☐	☐
Are junction boxes, outlets, switches, and fittings covered?	☐	☐
Is all metal fixed electrical equipment grounded?	☐	☐
Are flexible cords and cables fastened so that there is no direct pull on joints or terminal screws?	☐	☐
Are flexible cords and cables never substituted for fixed wiring?	☐	☐
Are flexible cords and cables not attached to building surfaces?	☐	☐
Do flexible cords and cables not run through holes in walls, ceilings, or through doorways or windows?	☐	☐
Does all equipment connected by cord and plug have grounded connections?	☐	☐
Are electrical appliances such as vacuums, polishers, vending machines, etc. grounded?	☐	☐
Are all portable electrical hand tools grounded? (Double-insulated tools are acceptable without grounding.)	☐	☐

	Yes	No
Are breaker switches identified as to their use?	☐	☐

RECORDKEEPING (29 CFR 1903.2-4.8)

Is employee poster (OSHA or equivalent state poster) prominently displayed?	☐	☐
Has a summary of all occupational injuries and illnesses been compiled at the conclusion of each calendar year and been recorded on OSHA Form No. 102? Was it posted during the month of February?	☐	☐
Have all OSHA records been retained for a period of 5 years, excluding the current year?	☐	☐
Have occupational injuries or illnesses, except minor injuries requiring only first aid, been recorded on OSHA Form Nos. 100 and 101, or equivalent?	☐	☐

INFORMATION SOURCES

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
1430 Broadway, New York, N.Y. 10018

- ☐ A12.1 Floor and Wall Openings
- ☐ A58.1 Minimum Design Load
- ☐ B15.1 Mechanical Power Transmission
- ☐ B31.1 Pressure Piping-Power Piping
- ☐ C1 National Electric Code
- ☐ Z4.1 Sanitation in Places of Employment
- ☐ Z9.2 Local Exhaust Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
470 Atlantic Ave.
Boston, Mass. 02210

- ☐ NFPA-10-1970 Installation of Portable Fire Extinguishers
- ☐ NFPA-101-1970 Life Safety Code
- ☐ NFPA-70-1971 National Electric Code
- ☐ NFPA 43D-1975 Pesticides in Portable Containers
- ☐ NFPA 30-1975 Container and Portable Tank Storage

AMERICAN PETROLEUM INSTITUTE (API)
2101 L Street, NW
Washington, D.C. 20037

API 2000 — Venting Atmosphere and Low Pressure Average Tanks

API 2003 — Protection Against Ignition Arising Out of Static Lighting and Stray Currents

NATIONAL SAFETY COUNCIL
444 North Michigan Avenue
Chicago, Illinois 60611

NIOSH and OSHA Regional Directors, trade associations, and insurance companies can also provide useful information. The Small Business Administration will provide information concerning procedures for securing economic assistance for compliance with the OSHA Standards (if needed).

NIOSH has published Criteria Documents for recommended standards for the following:

Arsenic
Carbaryl
Inorganic Cyanides
Inorganic Lead
Kepone
Malathion
Methyl Parathion
Parathion

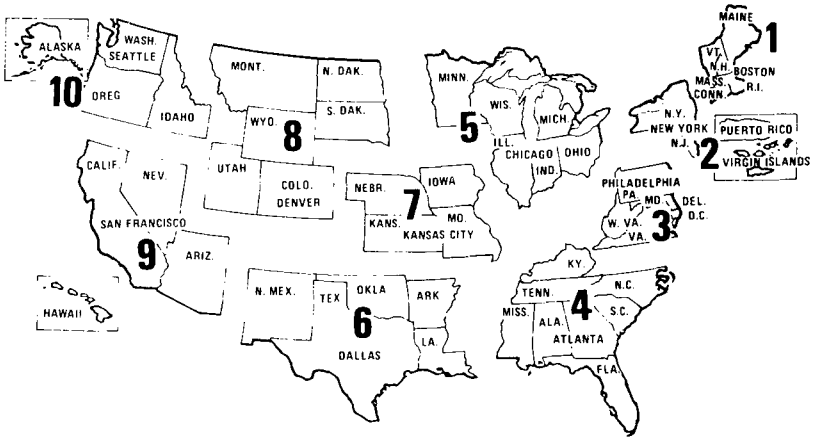
Copies are available from the address listed inside the front cover.

The Employee Good Practices Manual **"Working Safely with Pesticides"** (Pub. No. 76-147) is available from the address inside the front cover.

NIOSH REGIONAL OFFICES

The following pages list NIOSH and OSHA regional offices which can provide information on the OCCUPATIONAL SAFETY AND HEALTH ACT including questions on standards interpretations, voluntary compliance information, copies of the OSHA Standards, OSHA Act, Employee Rights Posting Notice, and publications.

REGIONS



NIOSH REGIONAL OFFICES

DHEW, Region I
Government Center
(JFK Fed. Bldg.)
Boston, Massachusetts 02203
Tel.: 617/223-6668/9

DHEW, Region II
26 Federal Plaza
New York, New York 10007
Tel.: 212/264-2485/8

DHEW, Region III
3525 Market Street,
P.O. Box 13716
Philadelphia, Pennsylvania 19101
Tel.: 215/596-6716

DHEW, Region IV
50 Seventh Street, N.E.
Atlanta, Georgia 30323
Tel.: 404/881-4474

DHEW, Region V
300 South Wacker Drive
Chicago, Illinois 60607
Tel.: 312/886-3881

DHEW, Region VI
1200 Main Tower Building
Room 1700-A
Dallas, Texas 75245
Tel.: 214/655-3081

DHEW, Region VII
601 East 12th Street
Kansas City, Missouri 64106
Tel.: 816/374-5332

DHEW, Region VIII
19th & Stout Streets
9017 Federal Building
Denver, Colorado 80202
Tel.: 303/837-3979

DHEW, Region IX
50 Fulton Street (223 FOB)
San Francisco, California 94102
Tel.: 415/556-3781

DHEW, Region X
1321 Second Avenue
(Arcade Bldg.)
Seattle, Washington 98101
Tel.: 206/442-0530

OSHA REGIONAL OFFICES

NOTE: For an office close to you, check your telephone directory under United States Government or dial 800-555-1212 and ask for the toll-free number of the OSHA office nearest you.

Region I

U.S. Department of Labor
Occupational Safety and Health Administration
JFK Building, Room 1804
Boston, Massachusetts 02203 _____Telephone: 617/223-6712/3

Region II

U.S. Department of Labor
Occupational Safety and Health Administration
1515 Broadway (1 Astor Plaza), Room 3445
New York, New York 10036 _____Telephone: 212/971-5941/2

Region III

U.S. Department of Labor
Occupational Safety and Health Administration
15220 Gateway Center, 3535 Market Street
Philadelphia, Pennsylvania 19104 _____Telephone: 215/596-1201

Region IV

U.S. Department of Labor
Occupational Safety and Health Administration
1375 Peachtree Street, N.E., Suite 587
Atlanta, Georgia 30309 _____Telephone: 404/526-3573/4 or 2281/2

Region V

U.S. Department of Labor
Occupational Safety and Health Administration
230 S. Dearborn, 32nd Floor
Chicago, Illinois 60604 _____Telephone: 312/353-4716/7

Region VI

U.S. Department of Labor
Occupational Safety and Health Administration
555 Griffin Square Building, Room 602
Dallas, Texas 75202 _____Telephone: 214/749-2477/8/9 or 2567

Region VII

U.S. Department of Labor
Occupational Safety and Health Administration
Federal Building, Room 3000, 911 Walnut Street
Kansas City, Missouri 64106 _____Telephone: 816/374-5861

Region VIII

U.S. Department of Labor
Occupational Safety and Health Administration
Federal Building, Room 15010, 1961 Stout Street
Denver, Colorado 80202 _____Telephone: 303/837-3883

Region IX

U.S. Department of Labor
Occupational Safety and Health Administration
9470 Federal Building, 450 Golden Gate Avenue
Post Office Box 36017
San Francisco, California 94102 _____Telephone: 415/556-0584

Region X

U.S. Department of Labor
Occupational Safety and Health Administration
6048 Federal Office Building
909 First Avenue
Seattle, Washington 98174 _____Telephone: 206/442-5930

☆ U.S. GOVERNMENT PRINTING OFFICE: 1977—757-052

KIND OF FIRE

DECIDE THE CLASS OF FIRE YOU ARE FIGHTING. . .

. . .THEN CHECK THE COLUMNS TO THE RIGHT OF THAT CLASS

APPROVED TYPE OF EXTINGUISHER

MATCH UP PROPER EXTINGUISHER WITH CLASS OF FIRE SHOWN AT LEFT

FOAM	CARBON DIOXIDE	SODA ACID	PUMP TANK	GAS CARTRIDGE	MULTI-PURPOSE DRY CHEMICAL	ORDINARY DRY CHEMICAL
Solution of Aluminum Sulphate and Bicarbonate of Soda	Carbon Dioxide Gas Under Pressure	Bicarbonate of Soda Solution and Sulphuric Acid	Plain Water	Water Expelled by Carbon Dioxide Gas		

CLASS A FIRES

USE THESE EXTINGUISHERS

ORDINARY COMBUSTIBLES
- WOOD
- PAPER
- CLOTH

ETC.

CLASS B FIRES

USE THESE EXTINGUISHERS

FLAMMABLE LIQUIDS, GREASE
- GASOLINE
- PAINTS
- OILS, ETC.

CLASS C FIRES

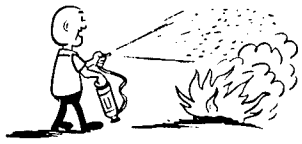
USE THESE EXTINGUISHERS

ELECTRICAL EQUIPMENT
- MOTORS
- SWITCHES

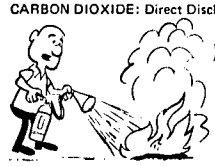
ETC.

HOW TO OPERATE

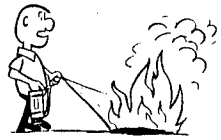
FOAM: Don't Play Stream into the Burning Liquid. Allow Foam to Fall Lightly on Fire.



CARBON DIOXIDE: Direct Discharge as Close to Fire as Possible. First at Edge of Flames and Gradually Forward and Upward

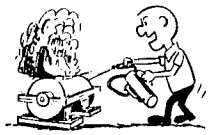


SODA-ACID, GAS CARTRIDGE: Direct Stream at Base of Flame



PUMP TANK: Place Foot on Footrest and Direct Stream at Base of Flames

DRY CHEMICAL: Direct at the Base of the Flames. In the Case of Class A Fires, Follow Up by Directing the Dry Chemicals at Remaining Material That is Burning



NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

HOW TO LIFT SAFELY

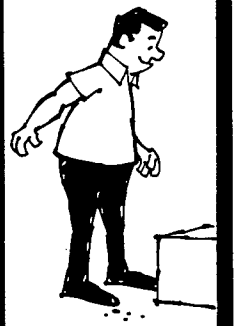
The following safe practices should be observed in order to avoid injury.

The factors that contribute to safe lifting are...

DETERMINE IF OBJECTS CAN BE LIFTED AND CARRIED SAFELY.

1. Approach the load and size it up (weight, size and shape.) Consider your physcial ability to handle the load.

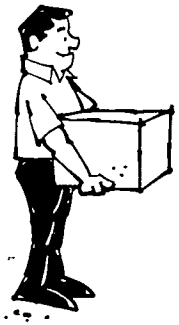
2. Place the feet close to the object to be lifted 8 to 12 inches apart for good balance.



3. Bend the knees to the degree that is comfortable and get a good handhold. Then using both leg and back muscles. . .

4. Lift the load straight up—smoothly and evenly. Pushing with your legs, keep load close to your body.

5. Lift the object into carrying position, making no turning or twisting movements until the lift is completed.



6. Turn your body with changes of foot position after looking over your path of travel making sure it is clear.

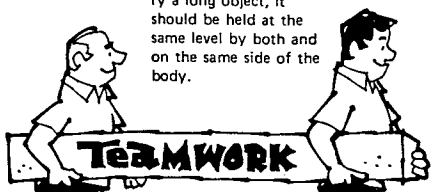
7. Setting the load down, is just as important as picking it up. Using leg and back muscles, comfortably lower load by bending your knees. When load is securely positioned, release your grip.

Stack material in such a manner as to permit full view while carrying.

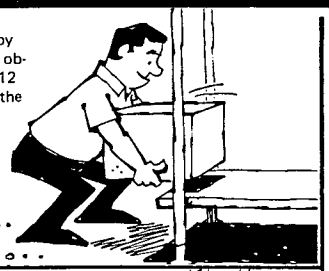
When lifting and carrying with another person—teamwork is important.

The load should be equally distributed. Movements must be coordinated so you both start and finish the lift action at the same time and perform turning movements together.

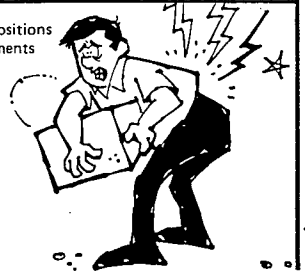
When two persons carry a long object, it should be held at the same level by both and on the same side of the body.



Avoid strain by storing heavy objects at least 12 inches above the floor.

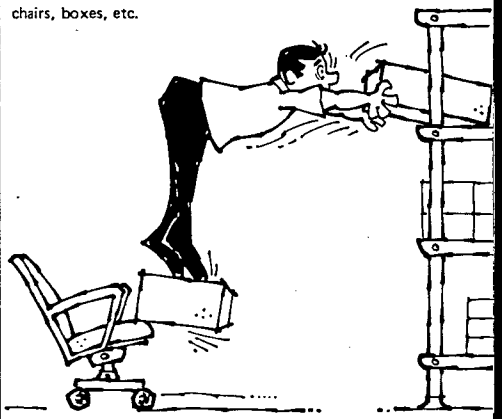


Avoid awkward positions or twisting movements while lifting.



Over-reaching and stretching to reach overhead objects may result in strains or falls.

Use a ladder instead of chairs, boxes, etc.



A

This chart is reproduced through the courtesy of:

United States Navy
Disease Vector Ecology and Control Center
U.S. Naval Air Station
Jacksonville, Fla. 32212

EMI

INSECTI(

Chemical Basis	Chlorinated Hydrocarbons	Organophosphorus Compounds	Carbamates	Arsei
COMMERCIAL PRODUCTS AND GENERIC NAMES	ALDRIN Benzene Hexachloride (BHC) Chlordane Chlorodecone (Kepone*) DDT Dicofol (Kelthane*) DIELDRIN ENDOSULFAN (THIODAN*) NB	Abate* AZINPHOSMETHYL (GUTHION*) CARBOPHENOTHION (TRITHION*) Chlorpyrifos (Dursban*) DEMETON (SYSTOX*) Diazinon Dicapthon (Di-Captan*) NB	ALDICARB (TEMIK*) Carbaryl (Sevin*) NB CARBOFURAN (FURADAN*) FORMETANATE HCL (CARZOL*) Metalkamate (Bux*) METHOMYL (LANNATE*)	LEAD PARIS SODIU
PHARAMACOLOGIC ACTION OR SITE OF TOXICITY	Neurotoxic CNS, Kidney Liver	Anticholinesterase (Irreversible)	Anticholinesterase (Reversible)	Cell Met
ROUTES OF ABSORPTION	Ingestion Inhalation Dermal	Ingestion Inhalation Dermal	Ingestion Inhalation Dermal	Ingestio Inhalatio
TOXICITY	Low to HIGHLY TOXIC	Low to HIGHLY TOXIC	Low to HIGHLY TOXIC	HIGHLY
S Y M P T O M S	Twenty minutes to four hours Nausea. Vomiting. Restlessness. Tremor. Apprehension. Convulsions. Coma. Respiratory failure. Death.	1. MILD - anorexia, headache, dizziness, weakness, anxiety, tremors of tongue and eyelids, miosis, impairment of visual acuity. 2. MODERATE - nausea, salivation, lacrimation, abdominal cramps, vomiting, sweating, slow pulse, muscular tremors. 3. SEVERE - diarrhea, pinpoint and non-reactive pupils, respiratory difficulty, pulmonary edema, cyanosis, loss of sphincter control, convulsions, coma, and heart block.	Constriction of pupils. Salivation. Profuse sweating. Lassitude. Muscle incoordination. Nausea. Vomiting. Diarrhea. Epigastric pain. Tightness in chest.	Thirty m Vomiting Profuse later. Colicky p and bo Dehydrati cramps. Cyanosis, extremi Headache Dizziness, Delirium Skin erup Convulsio Three ter Coma. General Death. Chief i tion are t teritis, b vomiting, containing lapse, sh Death ge failure. I pulmonary pnea, cya
T	1. Gastric lavage with 2-4 L. tap water. Catharsis with 30 gm. sodium sulphate in one cup of water. 2. Barbiturates in appropriate dosages repeated as necessary for restlessness or convulsions. 3. Watch breathing closely. Aspirate, oxygen and/or artificial respira-	SPEED IS IMPERATIVE 1. FOR EXTREME SYMPTOMS OF O.P. POISONING INJECT MASSIVE DOSES OF ATROPINE I.V. (2 TO 4 MG. OR 1/30 TO 1/15 GRAIN) EVERY 5-10 MINUTES UNTIL SIGNS OF ATROPINIZATION OCCUR. A TOTAL OF 25 TO 50	SPEED IS IMPERATIVE 1. FOR EXTREME SYMPTOMS INJECT MASSIVE DOSES OF ATROPINE I.V. (2 TO 4MG. OR 1/30 TO 1/15 GRAIN) EVERY 5 - 10 MINUTES UNTIL SIGNS OF ATROPINIZATION OCCUR. A TOTAL OF 25 TO 50 MG. MAY BE NEC-	1. For in with 2- instill solution For ski and wa not de arsenite. 2. Saline c

B

EMERGENCY MEDICAL TREATMENT FOR ACUTE PESTICIDE POISO

SECTICIDES

RODENT

Arsenicals (Inorganic)	Halogen Fumigants	Cyanide Fumigants	Phosphine Fumigants	Coumarin Inda
LEAD ARSENATE PARIS GREEN SODIUM ARSENITE	METHYL BROMIDE SULFURYL FLUORIDE (VIKANE*)	ACRYLONITRILE (ORGANIC BOUND CYANIDES) CALCIUM CYANIDE (CYANOGAS*) HYDROGEN CYANIDE (HYDROCYANIC ACID)	ALUMINUM PHOSPHIDE (CELPHOS*, DELICIA* PHOSTOXIN*)	Diphacinone (DI FUMARIN* Pival* (Pivalyn PMP (Valone*) Warfarin FLUOROACETA (COMPOUN
Cell Metabolism	Kidney, CNS depressant	Cell Metabolism	Lungs	Anticoagulant
Ingestion Inhalation	Ingestion Inhalation Dermal	Ingestion Inhalation	Inhalation	Ingestion
HIGHLY TOXIC	HIGHLY TOXIC	HIGHLY TOXIC	HIGHLY TOXIC	Low (Single dos HIGHLY TOXI (Multiple Doses
Thirty minutes to many hours Vomiting Profuse painful diarrhea—bloody later. Colicky pains in esophagus, stomach and bowel. Dehydration, thirst, muscular cramps. Cyanosis, feeble pulse and cold extremities. Headache. Dizziness, vertigo. Delirium or stupor. Skin eruption. Convulsions. Three terminal signs: Coma. General paralysis. Death. Chief initial symptoms of ingestion are those of a violent gastroenteritis, burning esophageal pain, vomiting, watery or bloody diarrhea containing much mucous, later collapse, shock, marked weakness. Death generally due to circulatory failure. INHALATION: may cause pulmonary edema, restlessness, dyspnea, cyanosis and foamy sputum.	Appears after four to twelve hours following inhalation. Symptoms include dizziness, headache, anorexia, nausea, vomiting, and abdominal pain. Lassitude, weakness, slurring speech and staggering gait. Mental confusion, mania, tremors and epileptiform convulsions. Bromides cause: Rapid respiration, pulmonary edema, cyanosis, collapse, and death. Coma, areflexia, and death due to respiratory or circulatory failure. Late manifestations may include bronchopneumonia, pulmonary edema, and respiratory failure. Methyl bromide may produce cutaneous blisters and kill via dermal exposure.	One of fastest acting known poisons. Massive dose — unconsciousness and death without warning. Smaller doses — illness may last one or more hours. Following ingestion, bitter, acrid, burning taste followed by constriction of membrane in throat. Salivation and nausea without vomiting. Anxiety, confusion, and dizziness. Variable respirations—inspiration short and expiration prolonged. Odor of bitter almonds in breath and vomitus. Initial increase in blood pressure and slowing of heart followed by rapid and irregular pulse, palpitation, and constriction of chest. Unconsciousness, convulsions, and death from respiratory failure.	Nausea, vomiting, diarrhea, great thirst, headache, vertigo, tinnitus, pressure in chest, back pains, dyspnea, a feeling of coldness, and stupor or attacks of fainting. May develop hemolytic icterus and cough with sputum of a green fluorescent color. Chronic poisoning may be characterized by anemia, bronchitis, gastrointestinal disturbances, dental necroses, and disturbances of vision, speech, and motor functions.	After repeated inge days: Bleeding fr and into conjun stool. Possible pallor and Late—massive ecch toma of skin, joi rhage. Shock and death. Fluoroacetate poi tral nervous syste
1. For ingestion lavage stomach with 2-3 L. of tap water and instill a glass of milk or a 1% solution of sodium thiosulfate.	1. IN METHYL BROMIDE POISONING, EARLY TREATMENT WITH BAL MAY BE CONSIDERED IF GIVEN BE-	SPEED IS IMPERATIVE. 1. If apneic, start artificial respiration. Keep airway open. 2. INHALATION OF AMYL NI-	No specific antidote. Keep patient quiet and warm. May need to treat incipient pulmonary edema with venesection, oxygen, and hyper-	1. Lavage stomach Catharsis 30 gm in 250 cc tap 2. Vitamin K (m

NIOSH

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health

ISONING

DENTICIDES	HERBICIDES			SOLVENTS
marins Indandiones	Organic acids and derivatives	Ureas	Miscellaneous	Hydrocarbons
inone (Diphacin*) RIN* (Pivalyn*) Valone*) rin	Cacodylic acid Dichlorophenoxyacetic acid (2, 4-D) DSMA, MSMA (Sodium Monoarsonates) Silvex (2, 4, 5-TP) Trichlorophenoxyacetic acid (2, 4, 5-T)	Bensulide (Betasan*) Bromacil (Hyvar-X*) Diuron (Karmex*) Fenuron - TCA (Urab*) Monuron (Telvar*)	Diquat (quarterny ammonia derivative) ENDOTHALL (Dicarboxylic acid derivative) PARAQUAT (quarternary ammonia derivative)	Petroleum Products including: Diesel oil Kerosene Gasoline Xylene
ROACETATE OMPOUND 1080) NB				
agulant	Liver Kidney	Respiratory	CNS Lungs Eyes	CNS Lung Kidney Liver
ion	Ingestion Dermal	Ingestion	Ingestion Inhalation	Ingestion
Single dose) to LY TOXIC ple Doses)	Low Toxicity	Low Toxicity	Low to HIGHLY TOXIC	Low Toxicity
peated ingestion for several Bleeding from nose, gums, nto conjunctiva, urine, and pallor and petechial rash. massive ecchymoses or hema- of skin, joints, brain hemor- nd death.	Weakness, and perhaps lethargy. Anorexia, diarrhea. Muscle weakness—may involve the muscles* of mastication and swallowing. Ventricular fibrillation and/or cardiac arrest and death.	During handling may cause irritation of eyes, nose, throat and skin. Ingestion: May cause gastroenteritis.	May cause: lethargy. convulsions. coma.	Nausea. Vomiting. Cough and pulmonary irritation progressing to pulmonary edema, bloody sputum, and bronchopneumonia. Heavy ingestion can cause symptoms of depression or irritation, including coma and convulsions.
cetate poisoning causes cen- vous system stimulation.				
e stomach with tap water. rsis 30 gm. sodium sulfate 0 cc tap water. in K (mephyton or men- e preparation) by mouth, muscularly or intravenously. in C may be a useful ad-	1. For ingestion, lavage stomach with tap water. For skin contact, wash exposed area. 2. Supportive treatment. 3. Quinidine sulfate or quinine to relieve myotonia or suppress abnormal ventricular cardiac rhy-	1. For ingestion, lavage stomach with tap water. For skin contact, wash exposed area. 2. Supportive treatment. 3. Avoid contact with skin, eyes and clothing.	1. Lavage and catharsis. 2. May need artificial respiration. 3. Barbiturates for convulsions.	NO EMETICS Use care to prevent aspiration. To dissolve kerosene and slow absorption, give 250 ml. (8 oz.) of liquid petrolatum orally. Follow with saline cathartic. Use gastric lavage if more than 4 mg/kg. (⅛ pint/150 lb.) has been ingested. Remove

TREATMENT	1. Gastric lavage with 2-4 L. tap water. Catharsis with 30 gm. sodium sulphate in one cup of water. 2. Barbiturates in appropriate dosages repeated as necessary for restlessness or convulsions. 3. Watch breathing closely. Aspirate, oxygen and/or artificial respiration if needed. 4. AVOID OILS, OIL LAXATIVES and EPINEPHRINE (ADRENALIN). DO NOT GIVE STIMULANTS 5. Give calcium gluconate (10% in 10 ml. ampules) intravenously every four hours. 6. DO NOT INDUCE EMESIS IF THE INGESTED POISON IS PRINCIPALLY A HYDROCARBON SOLVENT (e.g., kerosene). See note (1) below.	SPEED IS IMPERATIVE 1. FOR EXTREME SYMPTOMS OF O.P. POISONING INJECT MASSIVE DOSES OF ATROPINE I.V. (2 TO 4 MG. OR 1/30 TO 1/15 GRAIN) EVERY 5-10 MINUTES UNTIL SIGNS OF ATROPINIZATION OCCUR. A TOTAL OF 25 TO 50 MG. OR MORE MAY BE NECESSARY DURING THE FIRST DAY. WATCH FOR REDUCTION IN SALIVATION. Do not give atropine to a cyanotic patient. Give artificial respiration first then administer atropine. Oral atropine is never used and atropine prophylaxis is not recommended. 2. 2-PAM (Protopam chloride), 1 gm. I.V. slowly over a period of 5 minutes. Give a second dose of 500 mg. in 30 minutes if muscle weakness persists. 3. AVOID MORPHINE, THEOPHYLLIN, AMINOPHYLLIN, BARBITURATES OR PHENOTHIAZINES. 4. Keep airway open. Aspirate, use oxygen, insert endotracheal tube. Artificial respiration and tracheostomy in severe cases. 5. For ingestion, lavage stomach with 5% sodium bicarbonate. 6. For skin contact, wash with soap and water. Wear rubber gloves while washing contact areas. 7. Draw blood for cholinesterase test, preferably before 2-PAM is given.	SPEED IS IMPERATIVE 1. FOR EXTREME SYMPTOMS INJECT MASSIVE DOSES OF ATROPINE I.V. (2 TO 4MG. OR 1/30 TO 1/15 GRAIN) EVERY 5 - 10 MINUTES UNTIL SIGNS OF ATROPINIZATION OCCUR. A TOTAL OF 25 TO 50 MG. MAY BE NECESSARY DURING THE FIRST DAY. WATCH FOR REDUCTION IN SALIVATION. 2. Keep airway open. Aspirate, use oxygen, insert endotracheal tube. Artificial respiration and tracheostomy in severe cases. 3. For ingestion, lavage stomach with 5% sodium bicarbonate. 4. For skin contact, wash with soap and water. Wear rubber gloves while washing contact areas. 5. Morphine may be given if needed. AVOID THEOPHYLLIN, AMINOPHYLLIN, OR BARBITURATES. 2-PAM is not indicated. Oral Atropine is never used, and Atropine prophylaxis is not recommended 6. Draw blood for cholinesterase test.	pnea, cyanosis and 1. For ingestion la with 2-3 L. of t instill a glass of solution of sodiu For skin contact, and water. Acute not develop excep arsenite. 2. Saline cathartic (1 3. BAL in a 10% sol intramuscularly—(s 4. Check blood press shock. 5. Isotonic saline fo use to counteract 6. Morphine may b abdominal pain.
LABORATORY TESTS	No simple test. Only complex laboratory procedures. A high urine level of organic chlorine or especially of p-chlorophenyl acetic acid indicates exposure to DDT or to one of the analogous compounds. The level, however, is not indicative of the severity of exposure.	Cholinesterase test. Send 10cc heparinized blood to lab for plasma and red cell cholinesterase. Levels 30 - 50% of normal indicate exposure, although symptoms may not appear until the level falls to 20% or less. Urine p-nitrophenol may indicate exposure to parathion.	Cholinesterase test. Send 10cc heparinized blood to lab for plasma and red cell cholinesterase. Levels 30 - 50% of normal indicate exposure, although symptoms may not appear until the level falls to 20% or less. 1 - naphthol, normally found in traces, is excreted in urine in much higher concentration following Carbaryl (Sevin*) ingestion.	No simple test. laboratory procedures Save initial stomach urine for arsenic a may show red blood and casts. After ar urine shows hemoglob Reinsch Test.
	N.B. Additional Chlorinated Hydrocarbon compounds include: **ENDRIN** **Heptachlor** **Lindane (Isomer of BHC)** **Mirex* (Dechlorane*)** **PENTACHLOROPHENOL (PCP)** **Toxaphene**	N.B. Additional Organophosphorus compounds include: **DICHLOROVOS, DDVP (Vapona*)** **Dimethoate (Cygon*)** **DYFONATE*** **ETHION NIALATE** **FENSULFOTHION (DASANIT*)** **Fenthion (Baytex*)** **Gardona* (Rabon*)** **Malathion** **METHAMIDOPHOS (MONITOR*)** **MEVINPHOS (PHOSDRIN*)** **Naled (Dibrom*)** **PARATHION** **PHORATE (THIMET*)** **PHOSPHAMIDON (DIMECRON*)** **Ronnel (Korlan*)** **Supracide*** **TEPP**	N.B. Additional Carbamates compounds include: **MEXACARBATE (ZECTRAN*)** **Propoxur (Baygon*)** **SMDC (Vapam*)**	(British Anti-Lew Bromide poisoni SEVERE 1st day — 3.0 M 2nd day — 3.0 M 3rd day — 3.0 M Each of following 3.0 MG/KG q12

The following contributed to the revision of this chart, originally prepared in 1962 and revised periodically through 1974:

John P. Cannon, CAPT, MC, USNR-R
David L. Hayden, DVECC Staff Entomologist
Philip G. Koehler, LT, MSC, USNR
William B. Hull, CAPT, MSC, USN
Donald M. McCroddan, LCDR, MSC, USN
Richard T. Ramsay, HMC, USN

pnea, cyanosis and foamy sputum.				
1. For ingestion lavage stomach with 2-3 L. of tap water and instill a glass of milk or a 1% solution of sodium thiosulfate. For skin contact, wash with soap and water. Acute symptoms will not develop except for sodium arsenite. 2. Saline cathartic (15 to 30 gm). 3. BAL in a 10% solution in oil—intramuscularly—(see schedule). 4. Check blood pressure and treat shock. 5. Isotonic saline for intravenous use to counteract dehydration. 6. Morphine may be needed for abdominal pain.	1. IN METHYL BROMIDE POISONING, EARLY TREATMENT WITH BAL MAY BE CONSIDERED IF GIVEN BEFORE SYMPTOMS APPEAR. First remove patient from contaminated area. 2. Remove all contaminated clothing and wash contaminated skin —can penetrate ordinary rubber gloves. 3. Restrain confused and maniacal patients. Barbiturates for convulsions. 4. May require specific therapy for acidosis, pulmonary edema, bronchospasm, (use epinephrine subcutaneously), respiratory paralysis and/or kidney failure.	SPEED IS IMPERATIVE 1. If apneic, start artificial respiration. Keep airway open. 2. INHALATION OF AMYL NITRITE (AMYL NITRITE PERLES) every 15-30 seconds while 3% sodium nitrite solution is being prepared. 3. Intravenous injection (even of nonsterile solution) of 10 ml of 3% sodium nitrite over 2-4 minute period. DO NOT REMOVE NEEDLE. 4. Through same needle give 50 ml of 25% solution of sodium thiosulfate over 10 minutes. 5. If symptoms recur, repeat the nitrite and thiosulfate. 6. Stomach lavage with 1:5000 potassium permanganate should follow the above procedure. 7. Oxygen therapy and whole blood transfusions may be necessary if nitrite induced methemoglobinemia becomes severe.	No specific antidote. Keep patient quiet and warm. May need to treat incipient pulmonary edema with venesection, oxygen, and hypertonic glucose (50%) infusions. Intravenous isotonic solutions are contraindicated.	1. Lavage stomach with tap w Catharsis 30 gm. sodium su in 250 cc tap water. 2. Vitamin K (mephyton or adione preparation) by m intramuscularly or intravenc Vitamin C may be a useful junct. 3. Transfuse with fresh bloo bleeding is severe or until an is corrected. 4. Iron (ferrous sulfate) by m for correction of secondary mia, 0.3 gm. t.i.d.
				Fluoroacetate poisoning causes tral nervous system stimu (convulsions) and cardiac ar mias. Specific treatment is Monacetin (glycerol monoac intramuscularly, 0.5 mg pe every half hour for 12 hours. Injection sites.
No simple test. Only complex laboratory procedures. Save initial stomach contents and urine for arsenic analysis. Urine may show red blood cells, albumin and casts. After arsenic inhalation, urine shows hemoglobin. Reinsch Test.	No simple test. Only complex laboratory procedures. Blood electrolytes to detect acidosis.	No simple test. Only complex laboratory procedures. Send blood to lab for cyanide levels.	None	None. Prothrombin activity of plasma. Blood in urine and feces.

DOSAGE SCHEDULE FOR BAL

(British Anti-Lewisite Compound) (of value in arsenic, and Methyl Bromide poisoning) (2, 3-Dimercapto-1-Propanol or Dimercaprol)

SEVERE POISONING	MILD POISONING
1st day — 3.0 MG/KG q4h (6 INJ.)	2.5 MG/KG q4h (6 INJ.)
2nd day — 3.0 MG/KG q4h (6 INJ.)	2.5 MG/KG q6h (4 INJ.)
3rd day — 3.0 MG/KG q4h (4 INJ.)	2.5 MG/KG q12h (2 INJ.)

Each of following ten days (or until recovery).
3.0 MG/KG q12h (2 INJ.)

ADDRESS AND TELEPHONE NUMBER OF NEAREST POISON CONTROL CENTER

Center_____

Telephone Number_____

Address_____

N. B.
Fluoroacetate is not an Ant lant

Selected References:
+1. Clinical Toxicology 1963 Gleason, Gos
+2. Handbook of poiso
3. Clinical Handbook o USPHS CDC, Atl
4. Farm Chemicals Ha
5. Poisoning. Second E
+Recommended for all A

E

with tap water. sodium sulfate ater. phyton or men- on) by mouth, r intravenously. be a useful ad- fresh blood if or until anemia ate) by mouth secondary ane- d.	1. For ingestion, lavage stomach with tap water. For skin contact, wash exposed area. 2. Supportive treatment. 3. Quinidine sulfate or quinine to relieve myotonia or suppress abnormal ventricular cardiac rhythm.	1. For ingestion, lavage stomach with tap water. For skin contact, wash exposed area. 2. Supportive treatment. 3. Avoid contact with skin, eyes and clothing.	1. Lavage and catharsis. 2. May need artificial respiration. 3. Barbiturates for convulsions.	NO EMETICS Use care to prevent aspiration. To dissolve kerosene and slow absorption, give 250 ml. (8 oz.) of liquid petrolatum orally. Follow with saline cathartic. Use gastric lavage if more than 4 mg/kg. (½ pint/150 lb.) has been ingested. Remove patient to fresh air. Oxygen and corticosteroids may be needed in severe cases. Antibiotics are sometimes indicated.
aing causes cen- em stimulation cardiac arrhyth- atment includes l monoacetate) 5 mg per kg 12 hours. Vary				
ity of blood l feces.	No simple test. Only complex laboratory procedures.	No simple test. Only complex laboratory procedures.	None.	Chest X-ray may reveal pneumonia after a time lag of 24-48 hours.

an Anticoagu-

ology of Commercial Products. Second Edition, Gosselin, Hodge.
poisoning. Sixth Edition, 1969 Dreisbach.
book on Economic Poisons.
Atlanta, Ga.
Handbook, 1974.
ond Edition, 1958 Von Oettingen
all Armed Forces Medical Treatment facilities.

Notes:

1. For some insecticides (chlorinated hydrocarbons, botanicals) toxicity is chiefly that of solvent carrier rather than the insecticide compound itself, especially in diluted form. For treatment see "Solvents".

2. Gastric contents should be saved for analysis and legal purposes.

3. Common chemical and/or trade names derived from list prepared and distributed by FDA, DHEW, and Farm Chemicals Handbook. *Indicates trade name

4. Ranges of Toxicity (according to LD50's for rats and rabbits).

Category	Oral LD50(mg/kg)	Dermal LD50(mg/kg)	Inhalation LD50(mcg/L/hr	Probable Lethal Oral Dose for 70kg man (150 lbs)
Highly Toxic	0-50	0-200	0-2000	less than 1 tsp.
Moderately Toxic	50-500	200-2,000	2,000-20,000	up to 1 ounce
Low Toxicity	500-5,000	2,000-20,000	20,000 +	up to 1 pint
Slight Toxicity	5,000 +	20,000 +		up to 1 quart

5. Technical consultation and additional information regarding collection, preparation, preservation and transportation of specimens (blood, urine, etc.), may be obtained by contacting:

Chamblee Toxicological Laboratory
Environmental Protection Agency
4770 Buford Highway
Chamblee, Ga. 30341
Telephone: Area code
404 633-3311 Ext 5216

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