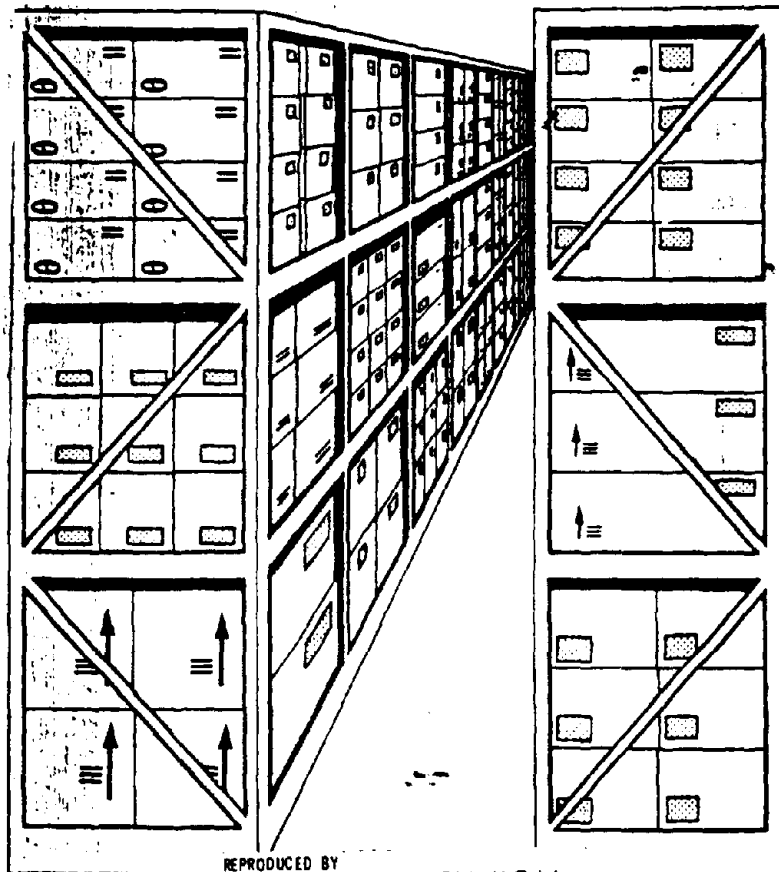


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HEALTH AND SAFETY GUIDE FOR PUBLIC WAREHOUSING



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

HEALTH AND SAFETY GUIDE
FOR
PUBLIC WAREHOUSING

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health
Division of Technical Services
Cincinnati, Ohio

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ABSTRACT

Health and Safety Guide for Public Warehousing

This health and safety guide provides information on occupational safety and health standards and presents detailed information about public warehousing. Safe warehousing practices and analysis of the workplace health and safety hazards are the general subjects discussed. The occupational health section of the guide contains information on the toxic effects of chemicals stored in public warehouses, and suggests controls. The guide should be of particular benefit to the small- to medium-sized employer who may not be able to afford the services of a health and safety consultant. It will enable the employer to establish an effective program for the recognition and control of hazards in the workplace.

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This booklet pertains to public warehousing and includes refrigerated warehousing and storage and general warehousing and storage. It does not include grain mills or bulk petroleum storage, areas previously addressed in NIOSH Health and Safety Guides, numbers 75-144, April 1975 and 76-118, November 1975 (revised), respectively. These publications can be obtained from NIOSH.

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INTRODUCTION

The Occupational Safety and Health Act of 1970 was passed "to assure safe and healthful working conditions for working men and women...." This Act established both 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 it authorizes the enforcement of standards. As part of its responsibilities, NIOSH conducts surveys to determine the most common health and safety problems in small businesses, and developed this guide specifically for distribution to the public warehousing industry.

This guide will assist employers in providing a safe and healthful workplace by describing safe work practices and by specifying the more frequently encountered safety and health violations found in the warehousing industry. It does not provide all the information for 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), or can be obtained from your OSHA area office. For the address and telephone number of your nearest area office, contact the nearest OSHA regional office listed in the back of this guide. In addition, some states offer OSHA-funded consultative services.

For additional information on chemical hazards and controls, contact either your nearest NIOSH regional office (see addresses at the end of this book) or your OSHA regional or area office.

The words "must," "shall," "required," and "necessary" appearing in this guide indicate requirements under Federal law. The words "should" or "suggested" are generally accepted good practices, not requirements.

In some states, the Federal government has delegated enforcement authority for occupational safety and health matters to the State government. Although state standards sometimes differ from Federal standards, they must always be at least as effective as the corresponding Federal standards.

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 with a health and safety program through which workplace hazards are recognized, evaluated, and controlled or eliminated. Such a program might include: (1) conducting fire drills, first aid courses, and periodic safety meetings, (2) developing chemical inventories and job hazard evaluations, (3) ensuring the adequacy and use of local exhaust ventilation and personal protective equipment, and (4) evaluating employee exposure through periodic air monitoring.

The employer should assign one person the responsibility for developing the program and for putting it into effect. The person responsible for carrying out the program needs adequate authority and management support if the program is to be successful.

Many hazards can be identified by conducting inspections, by interviewing employees for suggestions or complaints, by promptly investigating accidents, by reviewing injury and illness records, and by using this guide and other sources to anticipate health and safety problems. The identification and evaluation of certain hazards, such as airborne chemicals, almost always require an industrial hygiene survey.

An employee chemical protection form (see the back of this guide) may help identify basic health hazards. This form can be adapted to the needs of your program. Your NIOSH regional office or OSHA area or regional office can help you prepare it.

This guide describes many of the controls and work practices needed to eliminate common hazards; however, information on a specific control for a specific hazard (e.g., noise, chemical contamination, etc.) may require the services of consultants.



An employee safety committee can provide direct employee involvement in company safety programs.

EMPLOYEE TRAINING

A safe operation depends primarily on employee awareness of workplace hazards (in conjunction with management's efforts to reduce such hazards). Training plays an important part in making employees aware of the hazards found in warehouse work. Training needs will vary according to the particulars of an operation, but some general suggestions are:

- .Impress upon the employee the need to avoid contamination of air, clothing, skin, or eyes with hazardous chemicals. Explaining the hazards may motivate workers to handle such chemicals in a safe manner.
- .Be sure all employees know when and how to use and how to maintain the proper personal protective equipment. If such equipment is only used occasionally, employees must demonstrate in mock drills the ability to use the equipment.
- .Develop and maintain a list of standard and emergency procedures for each job category, and post it in the appropriate work areas.
- .Post appropriate warning signs and operating procedures wherever hazardous materials are handled or hazardous operations are performed.
- .Instruct employees in the use of portable fire extinguishers (refer to the fold-out chart in this book, and post it in a conspicuous place). Employees should conduct periodic drills.
- .Have at least one employee on each shift trained in first aid, including cardiopulmonary resuscitation (CPR).

.Be sure employees authorized to use either fixed or portable motorized equipment (including lift trucks) are thoroughly instructed in proper operation, inspection, and hazards of the equipment.

.Encourage good industrial housekeeping to reduce accidents and to develop in employees a sense of pride in their surroundings.

.Responsibilities should be specifically assigned for clean-up and (where necessary) decontamination.

.Instruct employees in safe lifting practices. Such training can prevent many physical injuries. (The chart titled "How to Lift Safely" can be removed from the back of this guide and posted.)

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL

In the public warehousing work environment, employees may be exposed to health hazards in a variety of forms--gases, dusts, mists, vapors, fumes, liquids, noise, heat, and cold. Chemical hazards often are not recognized because the particular formulations used are identified only by trade names. Many such formulations contain mixtures of several substances; this makes an evaluation of the hazard potential of the product difficult. Moreover, exposure to certain hazardous substances, such as benzene or asbestos (alone or in mixtures), can cause deadly diseases that do not show up until years later.

To identify occupational health hazards, the employer should make a materials analysis of all potentially hazardous substances in the warehouse. If the composition of a substance cannot be readily determined, request the necessary information from the manufacturer or supplier. Many manufacturers provide Material Safety Data Sheets which contain product information, such as chemical identity, toxicity levels, physical characteristics, personal protective equipment requirements, emergency procedures, and known incompatibilities with other substances. From this materials analysis, employers can recognize actual or potential hazards and prescribe suitable controls. Assistance in this effort is available from NIOSH regional offices (see back pages). 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) will supply information.

Employers should perform a job safety analysis which details all the chemicals used and all the products and by-products formed in each specific warehouse operation. To aid in the job analysis, a sample employee chemical protection form is included in the back of this guide. The analysis should include allied activities, such as maintenance and service operations. For example:

- 1 Welding or cutting performed around chlorinated materials can cause the formation of lethal gases (e.g., phosgene) and expose workers to welding fumes and ultraviolet radiation.
- 2 Lift trucks with internal combustion engines produce hazardous exhaust gases, including carbon monoxide and oxides of nitrogen. These gases can increase to harmful concentrations, especially in enclosed areas
- 3 The accidental mixing of certain cleaning agents can release poisonous gases. For example, when chlorine bleach and ammonia are mixed, poisonous chlorine gas is produced.
- 4 Organic solvents used to clean floors, parts, assemblies, or machinery can produce elevated levels of harmful vapors.

Chemical burns, skin rashes, dermatitis, and other skin conditions are widespread in U.S. industries. The use of protective creams or lotions, proper protective clothing and equipment, and personal on-the-job hygiene can prevent many common skin problems. For serious skin problems, enclosure of the offending process or substitution of a less irritating chemical may be required.

Various control methods can be used to prevent or reduce employee exposure to harmful chemicals or agents;

.Ventilation--Substances may be controlled either through local exhaust ventilation, (in which contaminants are removed at the point of generation) or through general mechanical ventilation (see "Occupational Health and Environmental Control").

.Substitution--If toxic substances must be used, substitute less toxic materials for more toxic ones whenever possible.

.Process change--Switch to a less hazardous process, if possible (for example, changing from gas/propane-operated fork lift trucks to electric lift trucks).

.Isolation--Place the hazardous process in a separate room or in a corner of the building to reduce the number of persons exposed.

Administrative controls--Limit the amount of time an individual is exposed to a health hazard by rotating exposed persons to work operations away from the hazard.

.Training and education of employees--Employees should be told what hazards they are exposed to and the ways to reduce or limit exposures (see "Employee Training").

.Personal hygiene--Persons should wash their hands before eating. If chemicals or solvents get on the skin, they should be washed off immediately. Employees should not be permitted to eat around toxic chemicals or in contaminated areas. Clothing should be changed and washed daily if it becomes contaminated with toxic chemicals, dusts, fumes, liquids, etc. The importance of personal hygiene controls cannot be overemphasized.

.Personal protective equipment--Respirators, hearing protection devices, protective clothing, and protective equipment should be used where needed (see "Personal Protective Equipment").

Air Contaminants

The most universal contaminants in the public warehousing industry are the exhaust gases from either gasoline or propane powered forklift trucks. (Propane-powered trucks produce less carbon monoxide than gasoline-powered trucks.) The combustion of propane and gasoline produces carbon monoxide, carbon dioxide, oxides of nitrogen, and aldehydes. Of these, carbon monoxide is the most serious problem. Exhaust gases can be either controlled through adequate ventilation or eliminated by changing to electric trucks.

Carbon monoxide is a highly poisonous gas. When it mixes with air it is possibly flammable and explosive. The initial symptoms of acute carbon monoxide poisoning include headaches, a feeling of oppression in the chest, dizziness, and sometimes nausea. These are followed by weakness of the leg muscles and finally loss of consciousness. Excessive exposure at very high concentrations can lead to death.

An employee's exposure to carbon monoxide may be excessive if warehousing operations are conducted in confined, poorly ventilated areas, such as semi-trailers or railroad cars. In these cases exhaust gases can be controlled by running a hose from the tail pipe of the forklift truck to the outside of the building, ensuring that the fumes do not reenter the building. If the hose cannot be run outside the building, it should be directed to an area of the building where the fumes can be removed through mechanical ventilation. Alternatively substituting electric forklifts, modifying existing equipment, or providing additional ventilation can lower the carbon monoxide concentrations to satisfactory levels. Forklifts should be turned off when not in use.

Catalytic exhaust purifiers can reduce considerably the level of carbon monoxide and other noxious gases in the engine exhaust. If used, these purifiers should be properly maintained and inspected on a regular basis, which must be maintained at a 19% minimum.

OSHA has established limits for airborne concentrations of hazardous substances. These standards for airborne exposures to carbon monoxide and other air contaminants are listed in the General Industry Standards, Title 29 of the Code of Federal Regulations, Part 1910.1000, or in the applicable State OSHA standards. For additional information on the hazards of industrial powered trucks see DHEW (NIOSH) publication No. 78-147.

AMMONIA

Ammonia; commonly used as a refrigerant in cold storage warehouses, is a potentially hazardous chemical. Low concentrations of airborne ammonia can cause eye and upper respiratory tract irritation; greater concentrations can cause convulsive coughing, possibly resulting in suffocation. Liquid ammonia is such a strong caustic that skin contact can produce first and second degree burns. Eye contact can lead to severe burns and blindness. Using colorimetric indicator tubes, employees should make frequent checks of airborne ammonia concentrations. In the case of accidental ammonia releases, NIOSH approved gas masks and air-supplied respirators should be readily available, but outside of the ammonia area. Safety showers and eye-wash fountains should be located throughout the work area. (See the OSHA standards relating to permissible levels of ammonia exposure.)

TOXIC MATERIALS

Public warehouses may store toxic materials which pose a serious risk to employees if spilled or accidentally released from containers. Other materials may not normally pose hazards to employees, but may react with fire and produce very toxic substances. The warehouse manager should collect Material Safety Data Sheets from the product manufacturer for all materials which are warehoused at his site. He should know each product's toxicity, the precautionary measures and protective equipment required for handling each product, and particular firefighting information for each product.

Chemically incompatible materials must be stored in separate, approved areas to prevent fire or explosions. For example, ammonium nitrate must be stored separately from all organic materials or contaminating substances, such as flammable liquids, acids, corrosive liquids, cork, sawdust, organic chemicals, coke, etc. Oxygen cylinders must be stored separately from fuel gas cylinders or other combustible materials (especially oil or grease). Applicable National Fire Protection Association (NFPA) codes and material safety data sheets will provide additional information on other chemically incompatible materials.

Some control methods which can prevent or reduce employee exposure to air contaminants are:

- .SUBSTITUTION of less hazardous equipment (for example, use of electrical powered lift trucks instead of diesel- or gasoline-powered trucks indoors).

- .ISOLATION (such as enclosure) of a hazardous process to reduce worker exposure to contaminants.

VENTILATION to reduce the amount of airborne contamination. This may be either local exhaust ventilation, which removes contaminants at the point of generation, or general dilution ventilation (see "Ventilation"). Air levels must be measured to determine the adequacy of the ventilation system.

- .ADMINISTRATIVE CONTROLS to limit the total amount of time any particular individual is exposed to a specific health hazard (for example, chemical vapors or gases) during the course of a workday.

.TRAINING AND EDUCATING employees by explaining to them what hazards they are exposed to and how to reduce or avoid exposure (see "Employee Training").

.PERSONAL PROTECTIVE EQUIPMENT, such as respirators, of protective clothing, and other items (see "Personal Protective Equipment").

.PERSONAL HYGIENE. Before eating and before leaving work, every employee should wash his/her hands and face to remove any chemicals contacted at work. Employees should not be permitted to store food near, or to eat or smoke around, toxic chemicals or in contaminated areas. If chemicals such as caustics, epoxies, solvents, or resins get on the skin, they should be washed off immediately. In addition, spare clothing should be available so that employees can change immediately (after showering or other decontamination) if work clothes become grossly contaminated with toxic dusts or liquids. Moreover, work clothing should be changed and washed daily if it is even moderately contaminated with these substances. Personal hygiene should be emphasized.

THE INDUSTRY AND ITS HAZARDS

Public warehousing involves materials handling and storage, and the primary safety hazards of this industry originate in materials handling. These hazards commonly include muscle and back sprains from improper lifting, injuries from falling materials, slips and falls on slippery or cluttered walking surfaces, accidents involving powered lifting and transportation equipment, injuries to hands and feet from improper handling of dock plates and exposure to high concentrations of carbon monoxide from gasoline or propane powered forklifts, especially when working in confined spaces such as trucks, railroad cars, etc.

Ammonia leaks from refrigeration units can also cause serious eye and upper respiratory tract irritation. Public warehouses may store materials which may be toxic to employees in case of spillage. Material Safety Data Sheets on each type of chemical stored must be obtained from the manufacturer or customer. These data sheets provide information about toxicity, precautionary measures, protective equipment, and firefighting information.

Besides air contaminants and skin irritants, many warehousing environments present the following dangers:

- .wet or slippery floors and working surfaces, tripping hazards,
- .toxic and combustible products,
- .elevated areas without standard railings and toeboards
- .electrical shock,.improper materials handling practices (both manual and mechanical),
- .improperly maintained aisles and exit ways,
- .improper illumination and blind corners.

Personal protective equipment, an adequate training program in proper material handling procedures, and good housekeeping practices are needed to reduce accidents in these areas.

FREQUENTLY VIOLATED REGULATIONS

INTRODUCTION

This section reviews OSHA regulations generally applicable to warehousing conditions and operations. The important points of each standard are summarized and, where possible, are listed in the same sequence as the OSHA safety and health standards (29 CFR 1910). Note that recognized hazards which are not yet covered by these regulations must still be controlled, even though there are no specific standards govern them.

Further assistance may be obtained from your State occupational safety and health agency, NIOSH regional consultant, or OSHA area office. The addresses and phone numbers for the OSHA and NIOSH regional offices are listed at the end of this booklet. In addition to the regional offices, OSHA maintains numerous local offices. For the location of the OSHA area office nearest you, contact your regional OSHA office. For detailed information on the control of noise, air contaminant levels, machine guarding, etc., you may need the services of a professional consultant. In December 1977, the Occupational Safety and Health Administration proposed eliminating certain general industry standards because they contributed little to the health and safety of employees. Throughout this guide, the standards under consideration for elimination are indicated.

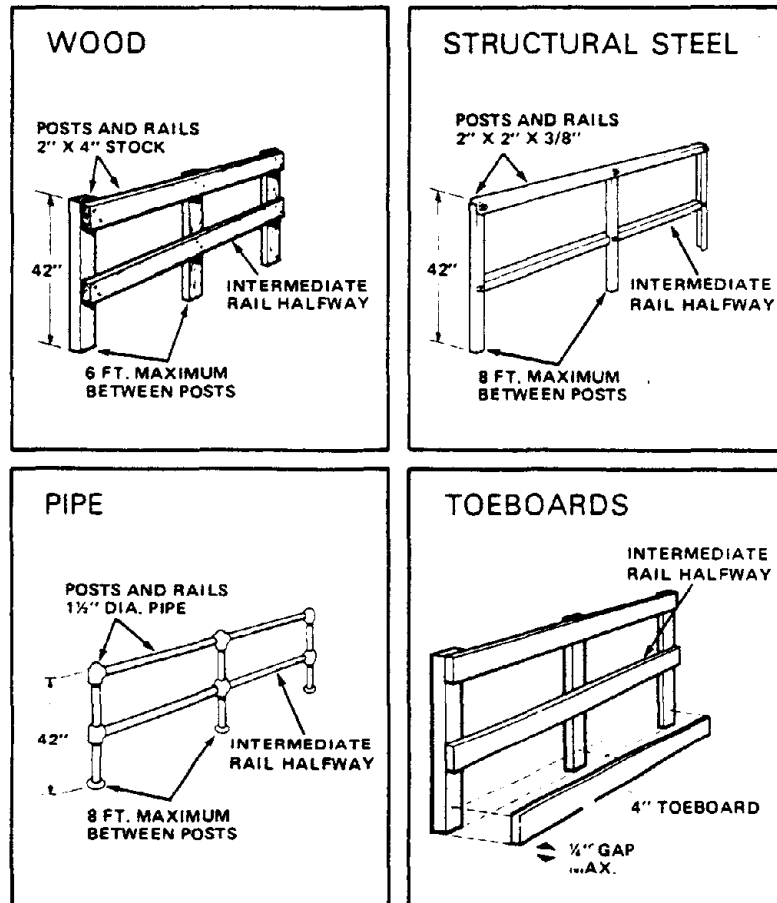
WALKING AND WORKING SURFACES

GENERAL REQUIREMENTS

- (1) All work areas, passageways, storerooms, and service rooms must be kept clean, orderly, sanitary, and as dry as possible. All spills should be cleaned up promptly. Floors in work areas must be kept free of oil spills, scrap, chips, and other debris.
- (2) Areas which are constantly wet or often wet where employees must walk or work should have nonslip surfaces, mats, or trenches with covering grates.
- (3) Every floor, work area, and passageway must be kept free of protruding nails, splinters, holes, and loose boards.
- (4) Where materials handling equipment is used, a sufficiently safe clearance must be provided for foot and vehicular traffic and yellow lane markings must be provided.
- (5) Obstructions that could create a hazard are not permitted in the aisles. Permanent aisles must be marked so that they are easily recognizable.
- (6) Floorload capacities must be posted in a readily visible location (except for slab floors with no basement). The floorload capacity is the maximum weight, expressed in pounds per square foot, which can be safely supported by a floor. If this information is not available or when floorload capacity is in doubt, a qualified engineer should be consulted. (OSHA may eliminate this requirement. Check with your OSHA area or regional office for more information.)

THE STANDARD GUARDRAIL AND TOEBOARD

In general, both a standard guardrail and toeboard are required on a platform or similar structure under or near which people walk. Such safeguards prevent employees from falling and prevent materials and equipment striking those below.

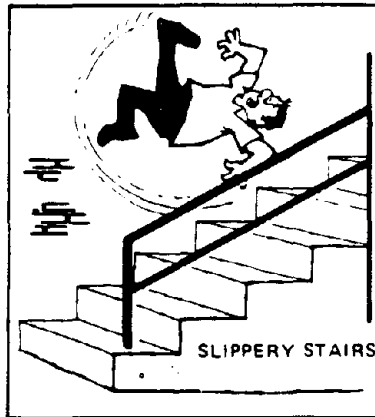
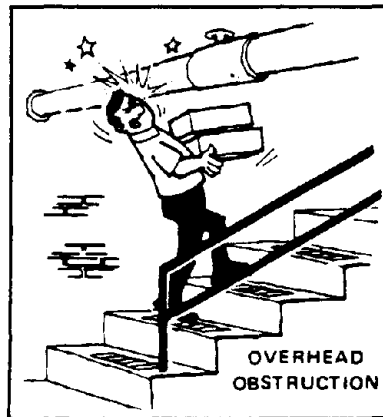


(Instead of standard railings, suitably supported wire mesh or screening of sufficient strength may be used.)

FIXED INDUSTRIAL STAIRS

.Riser height and tread width must be uniform throughout any flight of stairs.

.All treads must be reasonably slip resistant.



The MINIMUM PERMISSIBLE width is 22 inches (if a means of exit access, at least 28 inches).

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

.The minimum permissible width of a stairway is 22 inches. If the stairway leads to an exit, it must be at least 28 inches wide.

.The angle to the horizontal made by a staircase must be between 30 and 50 degrees.

.All stairs should be adequately lighted.

.If the stair tread is less than nine inches wide, the risers should be open.

The following requirements apply to flights of stairs having four or more risers:

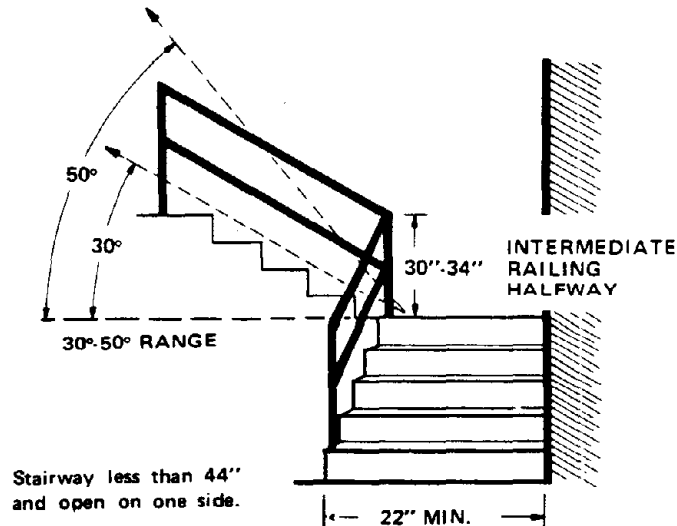
.A stair railing is required on each open side.

.If the stairway is less than 44 inches wide and both sides are enclosed, only one handrail is required, preferably on the right side descending.

.If the stairway is greater than 44 inches wide, a handrail is required on each enclosed side.

.If the stairway is greater than 88 inches wide, a stair railing located midway is required, in addition to side rails.

A stair railing must be 30 to 34 inches high, and it must be of construction similar to the standard guardrail.

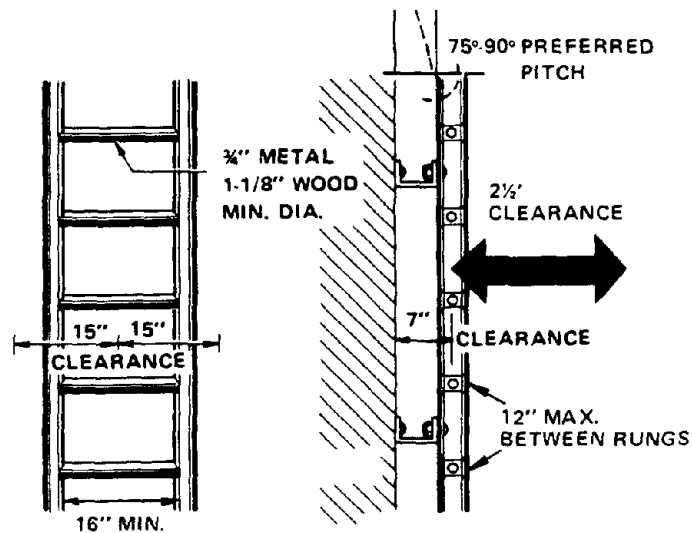


PORTABLE LADDERS

- .Portable ladders must be maintained in good condition at all times; this means tight joints, securely attached hardware and fittings, and freely operating movable parts. They must be kept coated with a suitable protective material if their construction or location makes them susceptible to corrosion. (OSHA may eliminate this requirement. Contact your OSHA area or regional office for more information.) Note: paint does NOT act as a suitable preservative for wooden ladders.
- .Ladders must be inspected frequently. Defective ladders must be tagged "Dangerous -- Do Not Use," and removed from service for repair or destruction. Ladders with broken or missing steps, rungs, or cleats, cracked or broken side rails, or other faulty parts must not be used.
- .Ladders should be stored where they will not be exposed to the elements; in addition, wood ladders should be stored where there is good ventilation. (This requirement may also be eliminated.)
- .Metal ladders must not be used near energized electrical equipment or wires and should be labeled with a warning against such use.
- .All ladders must be placed so that they have a secure footing. They must not be placed on boxes, barrels, boards, bricks, or other unstable structures to obtain additional height. Nonslip bases should be attached to the bottom of each ladder and maintained in good working condition.

FIXED LADDERS

- .Fixed ladders must be designed to withstand a single concentrated load of at least 200 pounds.
- .Rungs of metal ladders must have a minimum diameter of $\frac{3}{4}$ inch. Rungs of wood ladders must have a minimum diameter of $1\frac{1}{8}$ inches.
- .Rungs must be at least 16 inches wide, be spaced no more than 12 inches apart, and be free of splinters and burrs.



- .The preferred pitch for a safe ladder descent is 75 to 90 degrees. Unless caged or equipped with a ladder safety device, ladders with 90 degree pitch must have a 2 $\frac{1}{2}$ -foot clearance on the climbing side.
- .There must be at least a 7-inch clearance in back of the ladder to provide adequate toe space.

.Vertical ladders must have either cages or ladder safety devices if they are more than 20 feet long.

.Unless a ladder safety device is used, landing platforms must be provided on ladders more than 20 feet long. A platform is required every 30 feet for caged ladders and every 20 feet for unprotected ladders (when no ladder safety device is used).

.Side rails must extend at least 3 1/2 feet above landings.

EXITS AND EXIT MARKINGS

GENERAL REQUIREMENTS

The exit route must lead to a public way.

Areas around exit doors and passageways leading to and from exit doors must be kept free of obstructions.

Exit routes must not require travel through any hazardous area (unless the path of travel is effectively shielded by suitable partitions or other barriers).

An exit door or a door leading to an exit access area must be a side-hinged, swinging type. It must swing out in the direction of travel if 50 or more persons occupy the room or if it is an exit from a highly hazardous area.

Exits must be readily accessible at all times. Where exits are not immediately accessible from an open area, every occupant of that area must have access to two exits by separate paths. These paths must be through safe passageways, aisles, or corridors which lead directly to the exits.

EXIT MARKINGS

Every exit must have marked on it the word "EXIT" in plain, legible letters not less than 6 inches high with the strokes of the letters not less than 3/4 inch wide.

The visibility of the sign must not be impaired by decoration, furnishings, or other signs.

Doors, passageways, or stairways which are neither exits nor ways to an exit, but may be mistaken for an exit, must be clearly marked "NOT AN EXIT" or have a sign indicating their actual use, e.g., "TO BASEMENT," etc.

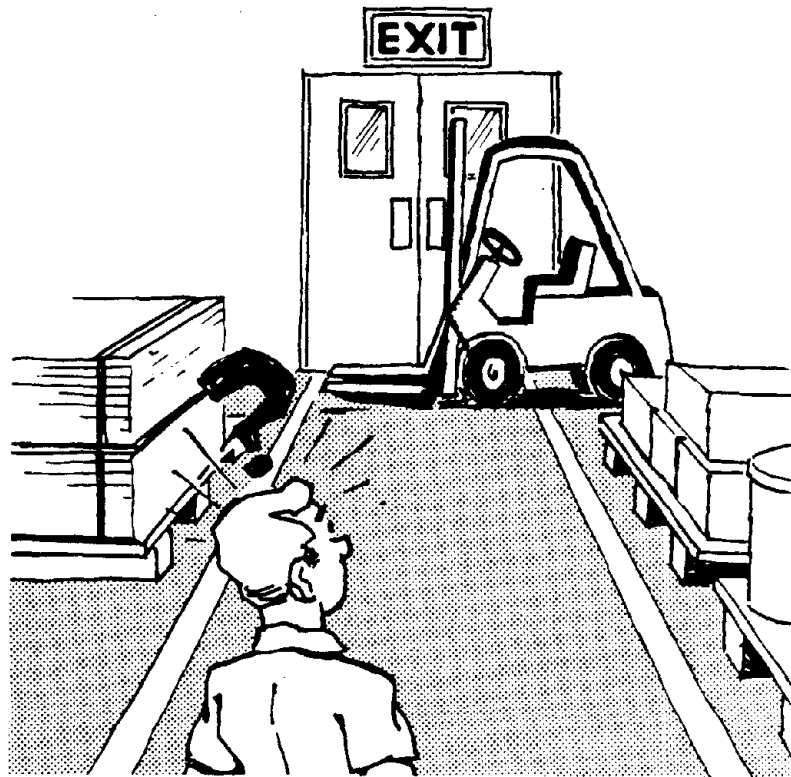


In areas where the direction to the nearest exit is not apparent, an exit sign with a directional arrow must be used.

Exit signs must be illuminated by a reliable light source if the building is occupied at night, or if normal lighting levels are reduced at times during working hours.

No lock or fastening may be used which prevents escape from inside the building.

If occupants of a building be trapped when any single exit is blocked by fire or smoke, there must be at least two means of exit remote from each other. (OSHA is considering the elimination of this requirement. Contact your OSHA area or regional office for more information.)



VENTILATION

Mechanical exhaust ventilation is generally the first choice for control of hazardous air contaminants. A properly designed local exhaust or dilution ventilation system not only can reduce air contaminants but also can eliminate fire hazards as well.

Local exhaust ventilation is a mechanical exhaust system that removes air contaminants very near their point of origin, typically through the use of hoods and ducts. The directional nature of local exhaust allows the removal of air contaminants without pulling them through the breathing zones of workers. Since it usually performs more efficiently than general dilution ventilation and (when properly designed) prevents air contaminants from entering the general environment, local exhaust is the preferred type of mechanical ventilation.

General dilution ventilation is an exhaust system in which fans pull a sufficient volume of air through the work area to dilute air contaminants to a safe level. Dilution ventilation requires a greater volume of air movement for efficient operation than does local exhaust.

Local exhaust systems should always be used instead of dilution systems in operations in which a large volume of air contaminant is generated or a particularly hazardous substance is used. Some common operations which usually require the use of local exhaust ventilation are plating, welding, spray painting, degreasing, and paint stripping.

General dilution ventilation is an effective control for areas with low concentrations of substances which are only moderately hazardous. For example, it may be used in some flammable liquid storage areas or in areas where substances presenting low health hazards are used or stored.

The design of effective and efficient ventilation systems frequently requires skilled assistance. For example, a determination must be made of (1) the volume of air which needs to be moved, (2) the type of decontamination or reclamation (if any) desired, (3) the type of fan which will adequately exhaust the air volume, (4) the shape and configuration of the exhausts, (5) the method for tempering of make-up air, and (6) the positioning of the system (see ANSI Code z9.2). A mechanical engineer skilled in the design of ventilation systems should be consulted when workplace ventilation systems are contemplated.

Note: A ventilation system capable of reducing air contamination to safe levels is designed to move a specific volume of air. Decreasing this volume (for example, by limiting make-up air) to conserve heated or cooled air-- or for any other reason-- can cause the concentration of air contaminants to rise to hazardous levels. To determine the minimum amount of air that needs to be exhausted, levels of air contaminants must be measured. Note also that make-up air that is too hot or too cold can cause heat or cold stresses on employees, leading to an increase in illnesses and accidental injuries.

Adequately ventilating a work area and limiting the time forklifts are left idling in indoor areas may be enough to prevent buildup of exhaust fumes in the work area. Catalytic exhaust systems can reduce the carbon monoxide levels in truck exhaust. Such systems are especially useful when ventilation alone is not adequate to produce safe levels.

All industrial ventilation systems should be regularly examined and maintained to ensure continued efficient functioning. Maintenance should include: cleaning the ducts, shaking out the baghouse, checking the V-belts or chain drives on the exhaust fans for slippage, breaks, or excessive wear, and inspecting the whole system for loose, damaged, or broken ductwork.

OCCUPATIONAL NOISE EXPOSURE

Although excessive noise levels are known to cause permanent hearing damage, noise regulations are commonly violated. Management must ensure that employees are not exposed to noise levels that exceed OSHA noise standards.

The current standard is a time-weighted average of 90 decibels A-scale (dBA) for an 8-hour exposure. Even at this noise level, hearing damage can be expected in some individuals. All employees exposed to an 85-90 dBA average for an 8-hour day should have their hearing checked every year by an audiometric test. This testing may soon be required by law.

An effective hearing conservation program, including annual audiometric testing, must be administered when noise levels average higher than 90 dBA over an 8-hour period. Engineering controls, such as enclosing noisy equipment, and/or administrative controls, such as limiting the duration of exposure, must be used where the 90 dBA level (8-hour, time-weighted average) is exceeded.

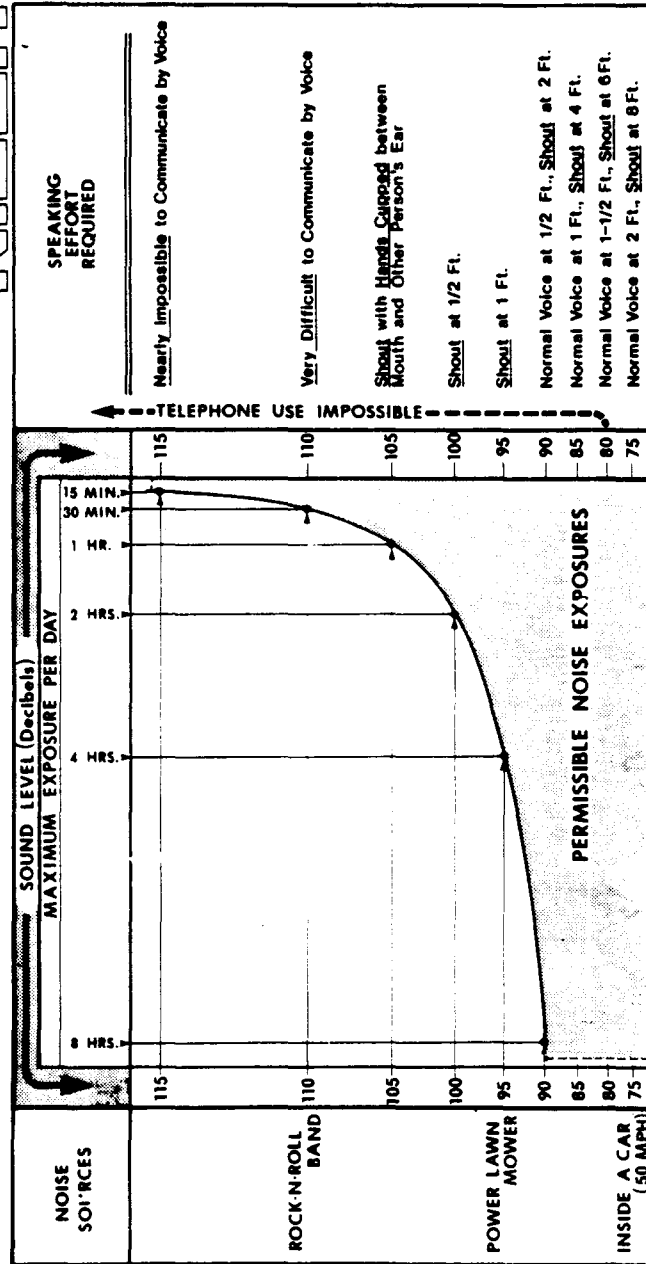
If such control measures are not feasible, then effective personal protective equipment must be provided to employees and must be used. Several types of personal hearing protection devices can be used, including ear muffs and ear plugs. Some devices are more useful than others, depending on the noise level, the frequency structure of the noise,

and the fit of the device on the ear. Devices that don't provide a good seal offer little hearing protection and will not satisfy the regulations. Ear protectors must not only be effective but must also be reasonably comfortable to the wearer.

The accompanying chart gives a rough indication of the intensity of noise levels from common workplace operations. If the chart suggests that levels and duration of exposure in your plant require corrective action, professional help should be sought to examine the situation. To ensure the success of your hearing conservation program, a noise survey by properly trained and equipped personnel should be made before engineering and administrative controls are put into effect. See the back pages of this guide for information on free consultative services provided by OSHA contracts in several States. Note that the noise level chart cannot be used to rule out the possibility that specific noise levels might exceed the standard. It is intended only as a rough guide to typical noise levels and exposures permitted under the existing OSHA noise regulations.

As emphasized above, determining workplace compliance with the noise standard requires measurement of the noise levels. Two types of measuring devices are available: a sound level meter which measures the level of noise at any particular time, and a dosimeter, which measures the average noise exposure over a period of time of the employee wearing it. Some instruments combine both measurement functions in one unit.

PERMISSIBLE NOISE EXPOSURES



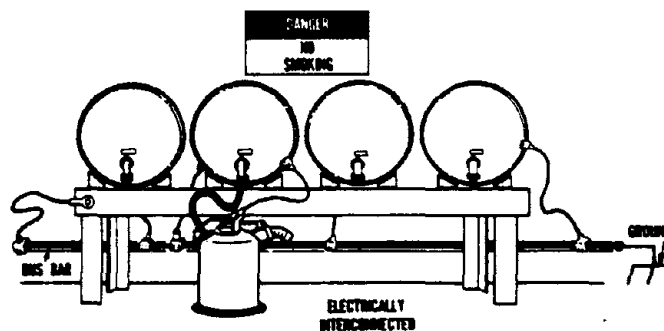
HAZARDOUS MATERIALS

FLAMMABLE AND COMBUSTIBLE LIQUIDS

The category "flammable" or "combustible" liquid is determined by the lowest temperature at which the vapors from a liquid will ignite when an ignition source is supplied. Vapors from flammable liquids ignite at lower temperatures than do those of combustible liquids. 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-tight and liquid-tight.

When flammable liquids are transferred from one container to another (for example, from a bulk container to a portable container), the containers must be effectively bonded and grounded. It is recommended that containers be individually grounded to the bus bar to ensure that a proper ground is maintained at all times. Bonding and grounding prevent electrical discharge (sparks) arising from the accumulation of static charge during liquid transfer operations.



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. Spilled 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. Such containers can be purchased from an industrial supply house.

All flammable liquids removed from bulk storage or drums must be kept in closed safety containers.

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

All storage areas must be posted as "NO SMOKING" areas. Portable and bulk containers of flammable or combustible liquids must be labeled with the required warning.

STORAGE OF HAZARDOUS MATERIAL

STORAGE CABINETS

Storage cabinets for hazardous materials must be distinctly labeled "FLAMMABLE - KEEP FIRE AWAY," and meet the National Fire Protection Association Standards.

Metal cabinets must be constructed of at least no. 18 gauge sheet iron and be double-walled with a 1 1/2-inch air space and leak-proof joints. Doors must have three-point locks and the sill must be at least 2 inches above the bottom of the cabinet.

Wooden cabinets must be constructed of at least 1-inch plywood. All joints must be rabbetted and fastened in two directions with flathead screws.

INSIDE STORAGE AREAS

Each inside storage area for hazardous materials must be prominently posted as a "NO SMOKING" area when flammable or combustible liquids are stored in containers larger than 55 gallon drums. Openings to other rooms or buildings must have noncombustible, liquid-tight raised sills or ramps at least four inches high, or the floor in the storage area must be at least four inches below the surrounding floor. An open-grated trench inside the room that drains to a safe location may be used as an alternative to a sill or ramp. Openings shall have approved self-closing fire doors. Where other portions of the building or other properties are potentially exposed to the stored hazardous materials, windows shall be protected as set forth in the Standard for Fire Doors and Windows, NFPA No. 80-1973, for Class E or F openings. Wood at least one inch nominal thickness should be used for shelving, racks, dunnage, scuffboards, floor overlay, and similar

installations. A general exhaust ventilation system (either gravity or mechanical) that completely exchanges the air within a room at least six times each hour is required. All lights, electrical equipment, and wiring must be of the type approved for use in hazardous locations. (That is, they must be explosion-proof fixtures.)

CONSTRUCTION OF INSIDE STORAGE ROOMS

Inside storage rooms shall be constructed to meet the fire-resistive rating required for their specific use. Such construction shall comply with the test specifications set forth in Standard Methods of Fire Tests of Building Construction and Materials, NFPA 251-1972. Where an automatic sprinkler system is provided, the system shall be designed and installed in an acceptable manner.

RATING AND CAPACITY

Storage in inside storage rooms shall comply with the standards in the following table.

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.

DESIGN, CONSTRUCTION, AND CAPACITY OF CONTAINERS

General

Only approved containers and portable tanks shall be used. Metal containers and portable tanks meeting the requirements of the containing products authorized by Chapter I, Title 49 of the Code of Federal Regulations (regulations issued by the Hazardous Materials Regulations Board, Department of Transportation), shall be deemed to be acceptable.

Emergency Venting

Each portable tank shall be provided with one or more devices installed in the top with sufficient emergency venting capacity to limit internal pressure under fire exposure conditions to 10 p.s.i.g., or 30 percent of the bursting pressure of the tank, whichever is greater. At least one pressure-activated vent having a minimum capacity of 6,000 cubic feet of free air (14.7 p.s.i.a. and 60° F.) shall be used. It shall be set to open at no less than 5 p.s.i.g. If fusible vents are used, they shall be actuated by elements that operate at a temperature not exceeding 300° F.

SIZE

Flammable and combustible liquid containers shall be in accordance with the following table.

MAXIMUM ALLOWABLE SIZE OF CONTAINERS AND PORTABLE TANKS

Container type	Flammable liquids			Combustible liquids	
	Class IA	Class IB	Class IC	Class II	Class III
Glass or approved plastic	1 pt.	1 qt.	1 gal.	1 gal.	1 gal.
Metal (other than DOT drums)	1 gal.	5 gal.	5 gal.	5 gal.	5 gal.
Safety cans	2 gal.	5 gal.	5 gal.	5 gal.	5 gal.
Metal drums (DOT specifications)	60 gal.	60 gal.	60 gal.	60 gal.	60 gal.
Approved portable tanks	660 gal.	660 gal.	660 gal.	660 gal.	660 gal.

NOTE-Container exemptions: (a) Medicine, beverages, foodstuffs, cosmetics, and other common consumer items, when packaged according to commonly accepted practices, shall be exempt from the requirements of 1910.106(d)(2)(i) and (ii).

Storage of containers shall be in accordance with the following tables and in buildings or in portions of such buildings cut off by standard firewalls, material creating no fire exposure hazard to the flammable or combustible liquids may be stored in the same area.

INDOOR CONTAINER STORAGE

Class liquid	Storage level	Protected, storage maximum per pile		Unprotected storage maximum per pile	
		Gallons	Height	Gallons	Height
A	Ground and upper floors	2,750 (50)	3 ft. (1)	660 (12)	3 ft. (1)
	Basement	Not permitted		Not permitted	
B	Ground and upper floors	5,500 (100)	6 ft. (2)	1,375 (25)	3 ft. (1)
	Basement	Not permitted		Not permitted	
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 the 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. and side aisles at least 4 ft. wide.

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

Note 3: Each pile shall be separated from each other by at least 4 ft.

INDOOR PORTABLE TANK STORAGE

Class liquid	Storage level	Protected storage		Unprotected storage	
		maximum per pile	Height	maximum per pile	Height
IA	Ground and upper floors	Not permitted		Not permitted	
	Basement	Not permitted		Not permitted	
IB	Ground and upper floors	20,000	7 ft	2,000	7 ft.
	Basement	Not permitted		Not permitted	
IC	Ground and upper floors	40,000	14 ft	5,500	7 ft.
	Basement	Not permitted		Not permitted	
II	Ground and upper floors	40,000	14 ft	5,500	7 ft.
	Basement	20,000	7 ft	Not permitted	
III	Ground and upper floors	60,000	14 ft	22,000	7 ft.
	Basement	20,000	7 ft	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 the 2 or more separate maximum gallonages.

Note 2: Aisles shall be provided so that no portable tank 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 separated from each other by at least 4 ft.

FLAMMABLE AND COMBUSTIBLE LIQUID WAREHOUSES OR STORAGE BUILDINGS

If the storage building is located 50 feet or less from a building or line of adjoining property that may be built upon, the exposing wall shall be a blank wall having a fire-resistance rating of at least 2 hours.

The total quantity of liquids within a building shall not be restricted, but the arrangement of storage shall comply with above tables.

Containers in piles shall be separated by pallets or dunnage where necessary to provide stability and to prevent excessive stress on container walls.

Portable tanks stored over one tier high shall be designed to nest securely, without dunnage, and adequate materials handling equipment shall be available to handle tanks safely at the upper tier level.

No pile shall be closer than 3 feet to the nearest beam, chord, girder, or other obstruction, and shall be 3 feet below sprinkler deflectors or discharge orifices of water spray, or other overhead fire protection systems.

Aisles of at least 3 feet wide shall be provided where necessary for reasons of access to doors, windows or standpipe connections.

A fire extinguisher must be available (12B minimum) and located within 10 feet of the door. Explanation of fire extinguisher codes is provided in material published by the National Fire Protection Association. The alphabetical code used above (12B) is explained on the fire extinguisher chart in the back of this guide.

OUTSIDE STORAGE AREAS

If flammable and combustible liquids are stored outside, the storage area must be graded to divert spills away from buildings. The storage area must be posted as a "NO SMOKING" area, and must be kept free of weeds, debris, and other combustible material. There must be a class 12B (minimum) fire extinguisher available at the storage area.

LP Storage Areas

The storage area must be posted as a "NO SMOKING" area. The LP tank must be guarded to protect it from vehicular damage. Electrical connections, pumps, switches, etc. must be vapor- and explosion-proof.



For information on storage of bulk petroleum products see DHEW (NIOSH) publication No. 76-118.

PERSONAL PROTECTIVE EQUIPMENT

GENERAL

Employees must be adequately protected whenever harmful physical agents or toxic substances are present. Personal protective equipment may not be used as a substitute for feasible engineering or administrative controls. If such controls are not feasible or are being currently fabricated and installed, personal protective equipment is required. Personal protective equipment must be of a safe design and construction and suitable for the work to be performed, and must be maintained in a sanitary and usable condition.

EYE AND FACE PROTECTION

Eye and face protection are required if there is a possibility of injury from flying particles, chips, or sparks, or from splashes of liquids such as acids, caustics, and organic solvents. For example, employees must wear protective equipment when working with grinders, power drills, sanders, polishers, or buffers, or with caustic or organic solvent degreasing or stripping baths.

Eye protectors and face shields must be easy to clean and disinfect. If goggles must be worn by employees who require corrective lenses, the goggles must fit over the glasses. If necessary, the corrective lenses (with the temples removed) can be mounted behind the protective goggle lenses. Note: Contact lenses can increase eye hazards since chemicals that are splashed into the eyes tend to seep under the lenses and get trapped. In addition, soft contact lenses can absorb some vapors and gases.

HEAD PROTECTION

A protective head covering (hard hat) is required in situations where workers can be struck on the head by falling objects. Bump hats protect only against bumps, not against falling objects, and may not be substituted for hard hats where protection from falling objects is necessary.

FOOT PROTECTION

Safety shoes are recommended to prevent injury to the feet from falling objects and other foot hazards. It is especially important that they be worn where heavy stock is handled. For such situations, metatarsal (instep) guards (which attach to ordinary steel-toed safety shoes) are available, increasing the protection. Safety shoes should be routinely worn by workers in parts handling, shipping, and receiving operations, and by other employees, as appropriate.

GLOVES

Gloves and arm protectors should be used by employees to prevent laceration by objects with sharp edges, to prevent contact with chemicals, and to prevent burns. Obviously, one type of glove can't perform all these functions equally well. Workers handling hazardous chemicals need impervious gloves. Those handling sharp objects need heavy canvas or leather gloves (reinforced, if necessary).

HEARING PROTECTION

Noise levels in some warehousing areas may be above the 90 dBA limit. If administrative controls aren't feasible, don't offer enough protection, or aren't desirable, engineering controls are necessary. While engineering controls are being fabricated for such areas, employees must be given, and must wear, hearing protection devices (see "Occupational Health and Environmental Control").

RESPIRATORY PROTECTION

NIOSH-approved respirators must be provided by the employer when workplace air is contaminated with excessive quantities of harmful dusts, fumes, mists, gases, or vapors. Note that 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 air contaminants to which the employees are exposed. The selection of an appropriate respirator also depends on the concentration of the air contaminant and the duration of exposure.
- .Written instructions covering the selection and use of respirators must be available.
- .Employees must be trained in the proper use, maintenance, and limitations of respirators.
- .Respirators should be cleaned after each use. They should be taken apart, washed, and dried; defective parts should be replaced.
- .If a respirator is used by two or more 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 functioning of the respirator, a good face seal is necessary. Beards, long sideburns, and glasses may make it impossible to get a good seal.

The cartridge or canister on the respirator must be replaced (1) when it has been used for its specified lifetime (as determined by the number of hours of use or by the breakthrough indicator), (2) when the employee can smell vapors in the mask, (3) when breathing becomes difficult, or (4) when the canister's or cartridge's storage life has expired--whichever occurs first.

The accompanying diagram shows the appropriate type of respirator once the physical form of an air contaminant is known. Respirator selection also requires a determination of the oxygen level in the work area atmosphere, which must be maintained at a 19% minimum.

GENERAL ENVIRONMENTAL CONTROLS

SANITATION

- .One toilet and one lavatory must be provided for approximately every 15 employees.
- .Each lavatory must have hot (or tepid) and cold running water, hand soap, and individual towels or warm air blowers.
- .Restrooms must be kept in a clean and sanitary condition.
- .Safe drinking water must be provided in all places of employment. The use of a common drinking cup is forbidden.
- .Beverages and food must not be stored or consumed in a toilet room or in any area where they could be exposed to toxic materials. Receptacles for waste food must be covered and kept in a sanitary condition.
- .Employees working with toxic substances should wash and, where necessary, change from contaminated clothing before eating, drinking, or smoking.

(When this guide went to press, OSHA was considering the elimination of the regulations on common drinking cups and the ratio of toilets to number of employees.)

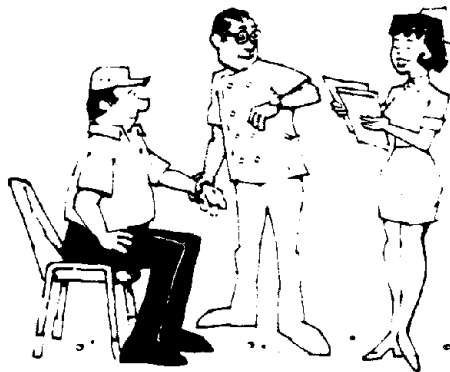


MEDICAL AND FIRST AID

The employer interested in maintaining production, preventing loss of work time, and encouraging efficient work performance should implement an employee health maintenance program. A good practice is to require medical examinations before job placement to ensure that prospective employees are physically able to do a specific job. Periodic health evaluations for employees performing hazardous jobs and early treatment of any work-related employee illness or injury should also be encouraged. Medical personnel must be readily available by phone or on-site for advice and consultation.

Emergency phone numbers must be posted near telephones. The Emergency Information Chart (printed inside the back cover of this guide) may be helpful. Stretchers and blankets should be available for the immediate transportation of ill or injured employees.

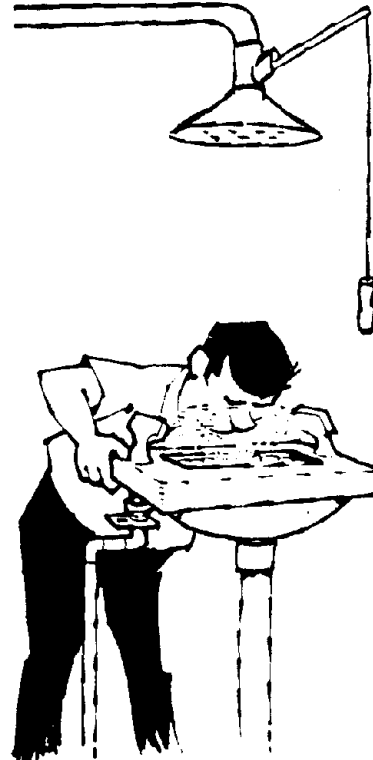
In the absence of an infirmary, clinic, or hospital near the workplace, at least one, and preferably more, employees on each shift must be trained in first aid. Local health departments, the American Red Cross, the U.S. Bureau of Mines, some insurance carriers, many local safety councils, and other organizations have first aid training programs that will satisfy OSHA requirements.



First aid supplies approved by a consulting physician must be readily available. The supplies should be in sanitary containers with individually sealed, sterile packages for material such as gauze, bandages, and dressings. Other items might include adhesive tape, triangular bandages (to be used as slings), inflatable plastic splints, scissors, and a mild soap for cleansing of wounds or cuts.

Suitable facilities for quick drenching or flushing of the eyes and body must be provided, within work areas where a person may be exposed to corrosive materials, such as acids or caustics.

Some states have laws which limit the extent of first aid that may be rendered by a lay person. Trained employees should understand where first aid ends and actual medical treatment begins.



NOTE: First aid is immediate, temporary treatment given in the event of accident or illness-- before the victim gets to a doctor or hospital.

Immediate first aid in some cases can prevent death or permanent impairment and can lead to a complete recovery.

FIRE PROTECTION

Maintaining a clean and orderly workplace reduces the danger of accidents and fires. Rubbish should be disposed of regularly. If it is necessary to store combustible waste materials (other than liquids), a covered, metal receptacle is required.

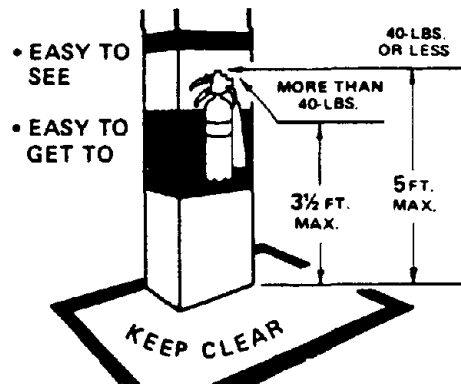
Cleaning materials can create fire and tripping or slipping hazards. Combustible sweeping compounds, such as oil-treated sawdust, can be fire hazards in some work environments. Floor coatings containing low flash-point solvents can be dangerous, especially if sources of ignition are near. All oily mops and rags must be stored in closed metal containers.

Some common causes of fires in all businesses are:

- .electrical malfunctions
- .friction
- .open flames
- .sparks
- .hot surfaces
- .smoking
- .disposal of incompatible materials

Proper maintenance and periodic safety inspections can reduce these hazards.

FIRE EXTINGUISHERS



Fire extinguishers must:

- .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 lighter. If heavier than 40 pounds, they must not be mounted higher than 3 1/2 feet. (OSHA is considering the elimination of this requirement. Contact your OSHA area or regional office for information.)
- .Be inspected by management or a designated employee at least monthly to ensure that:
 - (1) they are in their designated places;
 - (2) they have not been tampered with or actuated; and
 - (3) there is no corrosion or other impairment.

- .Be examined at least yearly and recharged or repaired, if necessary, to ensure operability and safety. (OSHA is also considering the elimination of this requirement.) A tag must be attached to show the maintenance or recharge date and the signature or initials of the person performing the service. (The tagging requirement may be eliminated. Check with your OSHA area or regional office for more information.)
- .Be hydrostatically tested (except factory-sealed, disposable units and pump-type units). Extinguisher sales representatives usually can perform this service at appropriate intervals.
- .Be selected on the basis of the type of hazard, the degree of hazard, and the area to be protected (see chart in back of this guide).
- .Be placed so that the maximum travel distances (unless there are extremely hazardous conditions), do not exceed 75 feet for Class A extinguishers or 50 feet for Class B extinguishers.

AUTOMATIC SPRINKLER SYSTEMS

Automatic sprinkler systems must meet the design requirements of the National Fire Protection Association's Standard for the Installation of Sprinkler Systems (NFPA No. 13-1973), as well as OSHA requirements.

- .Every automatic sprinkler system must have at least one automatic water supply of adequate pressure, capacity, and reliability.
- .Every automatic sprinkler system must have one or more fire department connections through which the fire department can pump water. No shut-off valve is allowed in such an automatic sprinkler system connection. (OSHA may eliminate these requirements. Check with your OSHA area or regional office for more information.)
- .The employer is responsible for the condition of the sprinkler system and must keep it in good operating order. Functional tests are required at least once each year.
- .The clearance between the sprinkler deflectors and the top of combustible storage material normally must be at least 36 inches. If the material is in solid piles less than 15 feet high or in piles less than 12 feet high with horizontal channels, the minimum clearance is 18 inches. Also, commodities containing only small amounts of combustible material may be stored up to 18 inches from the sprinkler deflectors.
- .Alarm systems audible to all employees must be provided on all automatic sprinkler installations.

TYPES OF SPRINKLER SYSTEMS

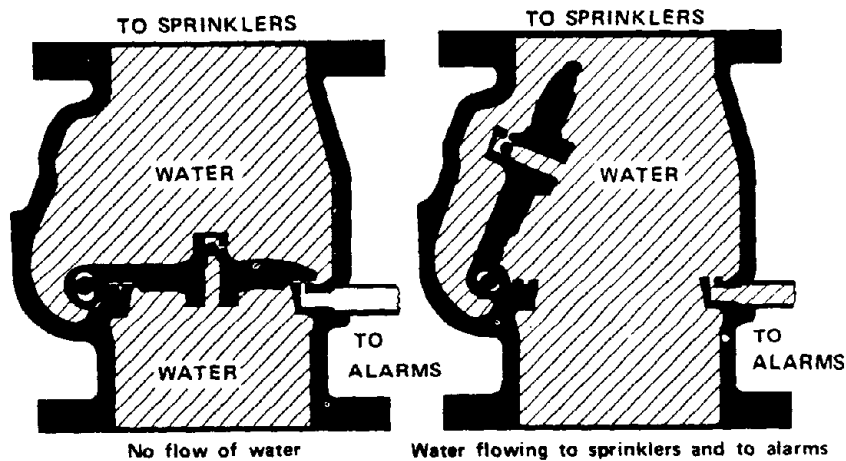
Wet-Pipe Sprinkler Systems

In the wet-pipe system water under pressure fills all the pipes to the sprinklers. This system discharges water immediately when heat activates the sprinklers. If parts of the system are subjected to below freezing temperatures, it is necessary to protect those portions with anti-freeze solutions. The anti-freeze must be water soluble and noncombustible.

When the sprinkler system is connected to public water mains, care must be taken to use only anti-freeze solutions that are acceptable to local health authorities.

In unheated areas this method of maintaining a wet-pipe system is suitable only for small installations because of the difficulty and expense involved.

NOTE: Piping must never be closed off and drained to avoid freezing unless such action is judged safe by the fire authorities having jurisdiction in the area.

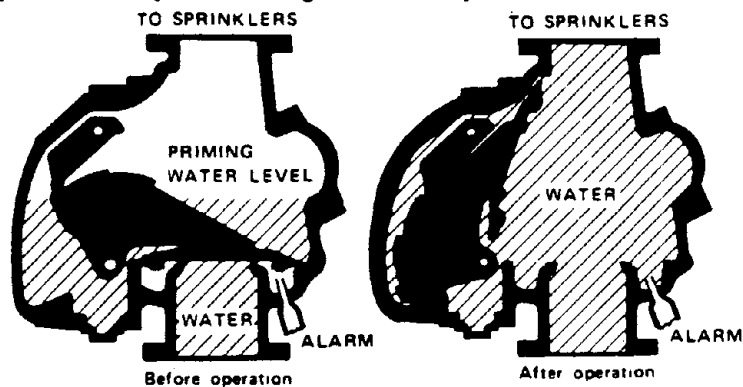


Dry-Pipe Systems

In areas exposed to freezing temperatures, a dry-pipe system is generally used rather than the wet-pipe and anti-freeze method. However, it is necessary that the water supply line and the dry-pipe valve be protected from freezing. Such protection is usually accomplished with a heated enclosure.

The dry-pipe system depends on compressed air in the pipes that holds back the water by exerting pressure on the dry-pipe valve. When a sprinkler opens, the air pressure drops, allowing the dry-pipe valve to open and the water to flow into the system.

Though satisfactory in many cases, dry-pipe installations are unsuitable for extremely hazardous areas because the mechanics of the system allow too much time to elapse before water is discharged. Although this delay can be shortened by the use of quick-opening devices, such a system is still not adequate for protecting extremely hazardous areas.



Pre-Action Sprinkler Systems

The main difference between a pre-action system and a standard dry-pipe system is that the pre-action system's water supply valve is opened by an independent, automatic fire-detection system rather than by the fusing of a sprinkler. The water supply valve can also be controlled manually.

The major advantages of a pre-action system over a standard dry-pipe system are:

- .The water supply valve is opened more quickly because the independent fire detectors are usually more heat sensitive than the sprinklers.
- .The detection system also rings an alarm.
- .The water gets to the fire more quickly.
- .Since the sprinkler piping is normally dry, the pre-action system is suitable for areas subject to below-freezing temperatures.

The Deluge System

This system is designed for the protection of extremely hazardous areas. The deluge system drenches an entire area by admitting water to pipes which have sprinklers that are open at all times. Deluge valves are triggered by automatic fire-detection devices located near the sprinklers. The water supply valves can also be controlled manually. Large amounts of water can be applied to a fire very rapidly with the deluge system.

Sprinkler Alarms

A sprinkler alarm is designed to sound whenever there is any flow of water from a sprinkler system equal to, or more than, the amount of flow from a single sprinkler.

- .Such waterflow alarms must be provided on all sprinkler installations.

- .All alarms must be accessible for inspection, removal, and repair.

- .Under conditions of variable water pressure, a retarding device must be installed. The system must have valves that can be repaired or removed without shutting off the sprinklers. The valves must be arranged so that they can be locked or sealed in the open position.

Dry Chemical Systems

Dry chemical fire protection systems must meet the design requirements of the National Fire Protection Association (NFPA No. 17-1973). These systems must be maintained in adequate operating condition at all times. Alarms or indicators of systems' operations are required, and a thorough inspection by a qualified individual must be made of the system at least annually. A report of the inspection should also be made on a regular basis.

Carbon Dioxide Systems

- .When a carbon dioxide system is discharged, an oxygen deficient atmosphere may exist. Suitable safeguards shall be provided both to insure the prompt evacuation of employees and to prevent the entry of persons into such atmospheres.

.At least annually, all carbon dioxide systems shall be thoroughly inspected and tested for proper operation.

.All high pressure cylinders shall be weighed twice a year. If the net contents of a cylinder shows a loss of more than 10%, it shall be refilled or replaced.

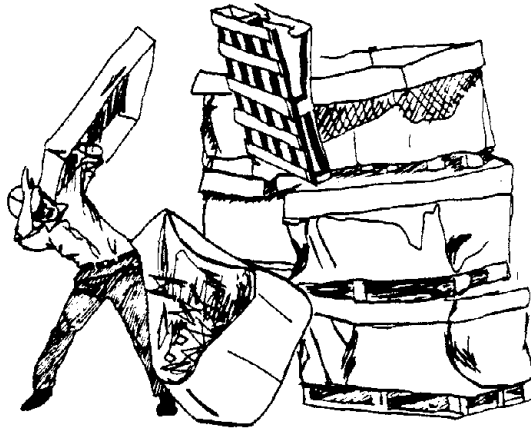
.If low pressure containers show a loss of 10% or more, they shall be refilled, unless minimum gas requirements are provided.

MATERIALS HANDLING AND STORAGE

MATERIALS HANDLING

Safe Warehousing Methods

The storage of materials must not itself create a hazard. Materials stored in tiers (whether in bags, in containers, in bundles, or on pallets) must be stacked, strapped, blocked, or in interlocked, and limited in height so that the tiers 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 equipment, or exits.



All containers should be kept closed when not in use. If any leakage occurs, the damaged container must be removed and any fire or slipping hazard eliminated. Material Safety Data Sheets should be stored in a convenient location for ready use in an emergency by trained personnel. Decontaminating and neutralizing materials should be readily available.

Aisles in the storage area must be kept free of obstructions, and sufficient clearance must be maintained for foot and vehicular traffic. Where limited clearance exists (for example, low pipes or doorways), clearance limit warning signs must be posted. All permanent aisles and passageways must be appropriately marked, preferably with lines on the floor. Proper drainage must be maintained throughout the storage area. (OSHA is now considering the elimination of this drainage requirement. Contact your OSHA area or regional office for more information.)

SPACE LAYOUT

When laying out storage space, the following safety factors should be considered:

- .The Nature of the Stored Material--Hazardous commodities, including flammable, incompatible, and toxic materials, should be segregated from each other and other supplies.
- .Floorloads--The floorload capacity is the maximum weight of stored supplies that can be safely supported by the floor. This capacity is expressed in pounds per square foot of storage space. When this information is not available and floorload capacity is in doubt, you should consult a competent engineer to determine the maximum floorload capacity. These floorload capacities MUST be posted in a readily visible location. (OSHA is considering deleting this last requirement).
- .Doors--Doors should be of sufficient height and width to readily accommodate the safe use of materials handling equipment.

.Loading Facilities--Adequate space for the safe loading and unloading of warehouse materials is a must. This includes maintaining sufficient aisle space leading to the loading dock.

.Stock Clearance--Standard regulations on stack clearance should be observed, keeping in mind the requirement for clearance below fire protection sprinkler heads (see "FIRE PROTECTION").

.Layout of Aisles

.Safe operations within the storage areas REQUIRE considerable attention to space layout for aisles. There MUST be enough operating space for handling and stacking materials safely.

.Aisles should be planned to provide easy access to exits and fire control equipment. They should be straight and clear of obstructions.

.A clear space should be maintained around fire protection equipment and the location of such equipment should be well marked. Obstructions such as columns and posts should be marked, preferably with diagonal black and yellow stripes.

Floors and Stairways

.Floors, stairways, and loading areas MUST be kept clear of slipping and tripping hazards, such as oil spills or splintered or damaged floors.

.All drums should be kept tightly sealed. If leakage occurs, the damaged container MUST be removed and any resultant fire or slipping hazard eliminated.

Housekeeping

To ensure the safety and health of those who work in or around the warehouse, the highest standards of housekeeping are necessary. The following standards should be in effect:

- .The warehouse should have adequate lighting.
- .Machines, equipment, and working surfaces should be kept clean and in good condition.
- .Plenty of approved waste containers should be located throughout the warehouse
- .Tools should be stored in an orderly manner.
- .Scrap material should be systematically disposed of.

Storage Racks

Storage racks should be inspected periodically for cracks, weaknesses, or severe indentations resulting from collisions with lift trucks. Defective racks should be repaired or replaced. Wooden guards, preferably marked with black and yellow stripes, should be used at the corners of stacked materials to prevent accidental dislodging and to protect the stacks.



When barrels or drums are stored on end, sturdy platforms, such as wooden planks, should be placed between each level. When stacked on their sides, the barrels on the bottom row should be very securely wedged on each end. Twenty-gallon or smaller drums should be tied or bound together in groups for stability and for security from falling.

STORAGE OF TOXIC MATERIALS

Toxic materials in solid form, such as bags of pesticides, are sometimes stored in public warehouses prior to distribution. Whenever possible, the warehouse should insist that the materials be sealed in closed containers for storage. Warehouse employees might be exposed to the dusts of these materials either during unloading or if a container breaks, resulting in spillage. Material safety data sheets on all such products should be obtained from the manufacturer and kept handy for ready access by the warehouse supervisor. Employees should have immediate access to proper personal protective equipment and should know proper clean-up methods whenever a dust exposure to a toxic material might occur. When floors must be cleaned of dust containing toxic solids, it is preferable to use either a vacuum cleaning system equipped with a high efficiency particulate filter (HEPF) or other suitable dust filter for collection. Sweeping or blow-downs should be avoided since such procedures tend to make the toxic material again airborne.

Storage of toxic gases or of liquids which might evaporate require additional precautions. Such materials should be stored in separate rooms closed off from any area which might be used for food or household item storage. Toxic materials must not be stored with incompatible materials which can explode if they come in contact with each other. Such indoor storage areas should be equipped with a forced air

ventilation system that provides a complete air change in the room at least six times per hour. When liquids are stored in containers of 55 gallons or less, it is unlikely that large quantities of liquids would be spilled or leaked at any given time. Such spills can be contained by absorption of the free liquid by charcoal or some other suitable granular solid. The solid can then be scraped up, placed in a sealed container, and properly disposed of. When liquids are stored in containers larger than 55 gallon drums, a raised sill or ramp should be provided around the storage area to contain leaks; or an open-grated trench may be used to capture the liquid and drain it to a safe location.

During a liquid spill or gas leak, employees should be provided with suitable respiratory protective equipment. (Such equipment should be stored in adjacent but readily accessible locations near the storage area.) Employees not directly involved in the clean-up should be evacuated.

When warehousing toxic materials, it is imperative that employees be informed of the hazardous properties of the substances and be repeatedly instructed in proper protective measures. Temperatures inside warehouses should be maintained at acceptable levels to prevent containers from exploding and releasing toxic vapors into the air. It is recommended that a list of stored toxic or reactive materials be provided to local fire departments so that they can respond more effectively in an emergency.

COLD STORAGE

Common hazards encountered in cold storage areas are frostbite, falls on icy surfaces, and skin contact with cold surfaces which can cause the skin to freeze to the surface. Workers should be trained to detect early signs of frostbite and numbness from the cold.

The use of proper personal protective equipment will prevent these types of injuries.

Sufficient exits must be provided for use in emergencies. Cold storage rooms must be equipped with at least one door that can be opened from the inside.

REFRIGERANTS

Problems which can occur during the installation, modification, or repair of refrigeration units are leakage and, infrequently, fire or explosion. Three classes of refrigerants are:

- .Nonflammable refrigerants--Although the toxicity of these refrigerants is slight and although they are considered fairly safe, in high concentrations they can be just as deadly as more toxic agents. In addition they can decompose into highly toxic gases (e.g., hydrochloric acid, chlorine, phosgene, etc.) upon exposure to hot surfaces (sweating, welding, etc.) or open flames.

- .Toxic and corrosive refrigerants--These refrigerants can be flammable in concentrations exceeding 10.7% and 16.0%, respectively, by volume. Ammonia is the most common refrigerant in this category, and is very irritating to the eyes, skin, and respiratory system. In large releases of ammonia, the affected area must be evacuated. Re-entry to evaluate the situation may only be made wearing appropriate respiratory protective devices, e.g., self contained breathing apparatus (SCBA), and impervious protective clothing. As ammonia is readily soluble in water, it may be necessary to spray water in the room via a water mist type nozzle

to lower concentrations of ammonia. Prior to removing respiratory protective devices, atmospheric testing should be performed to ensure the absence of an acutely dangerous concentration. Such testing equipment, e.g. lengths of stain tubes, should be stored and maintained for emergency use.

.Highly flammable and/or explosive substances (propane, ethylene, etc.) must be used only with strict engineering controls, safety equipment, and administrative controls. If a refrigerant escapes, action should be taken for removal of the contaminant from the premises. If ventilation is used, exhaust from the floor area must be provided for heavier than air gases and, conversely, from the ceiling for lighter than air gases. Ammonia reacts rapidly with water and tends to hover closer to ground levels.

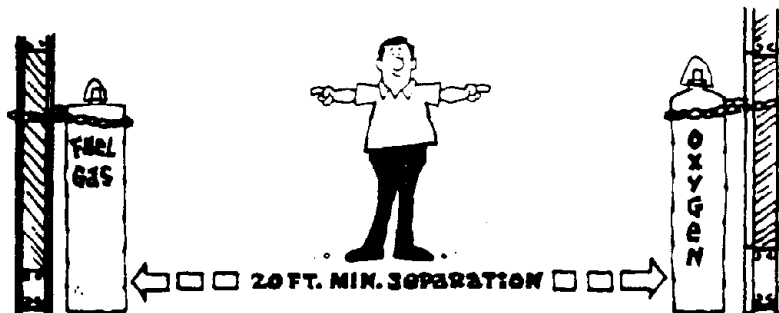
CYLINDER STORAGE

Oxygen and fuel gas cylinders stored inside buildings must be located in a well-protected, well-ventilated, dry location at least 20 feet from flammable or highly combustible materials and away from elevators, stairs, or gangways. They must not be kept in unventilated enclosures, such as lockers and cupboards. All cylinders must be kept away from radiators and other sources of heat.

Valve protection caps must be used if the cylinder is designed to accept a cap, except when cylinders are in use or connected for use.



Stored oxygen cylinders must be kept separated from stored fuel gas cylinders or flammable or combustible materials (including oil and grease) by a minimum distance of 20 feet or by a noncombustible barrier at least 5 feet high and having a 1/2-hour fire resistance rating. Note that a sheet metal partition is not an acceptable method of separating cylinders.



The following guidelines pertain to the storage of oxygen and fuel gas cylinders:

- .All cylinders must be legibly marked to identify the contents.
- .To prevent toppling, no cylinder should be permitted to stand alone without being secured with a lashing or chain.
- .Indoor storage of fuel gas must be limited to a total capacity of 2,000 cubic feet or 300 pounds of liquified petroleum (LP) gas.
- .Empty cylinders must be stored separately, but in the same manner as full cylinders. Cylinders must not be lifted by the valve protection cap.
- ."No Smoking" signs must be posted and smoking prohibited in or around compressed gas storage sheds.

MANUAL HANDLING PROCEDURES

Manual handling is relatively safe if proper lifting and carrying positions are used. The failure of personnel to use mechanical lifting devices for handling heavy loads is one of the major causes of material handling accidents and injuries. Hernias, back strains, crushed hands and feet, broken bones, and severe lacerations are the more common results of poor manual handling practices. One of the most important factors in manual handling safety practices is the adequate training of personnel. Employees must receive thorough instructions in both safe lifting and carrying procedures and in personal protective equipment usage. Adequate supervision is necessary to ensure that safe practices are being observed at all times. Jewelry, rings, and loose clothing must not be worn during handling operations. Safety toe shoes should be worn by employees. Safe lifting procedures must be used by workers at all times. (See the chart "How to Lift Safely" in the back of this book.)

MECHANICAL HANDLING AND LIFTING DEVICES

Mechanical materials handling involves the use of many different types of cranes, derricks, rope and chain hoists, and special purpose vehicles. These devices are designed to promote efficiency in moving and handling heavy materials and cargo. Improper or unsafe use of equipment and vehicles accounts for a major portion or all mechanical handling accidents. Defective and damaged equipment is a potential source of accidents and fire hazards (if gasoline-powered vehicles and handling equipment are used). The two primary hazards inherent in the operation of lift trucks are collision or overturning of the truck and movement or collapse of bridge plates, dockboards, or other trucks or trailers. Additional accidents occur when cartons, boxes, or other articles fall from lifting vehicles.

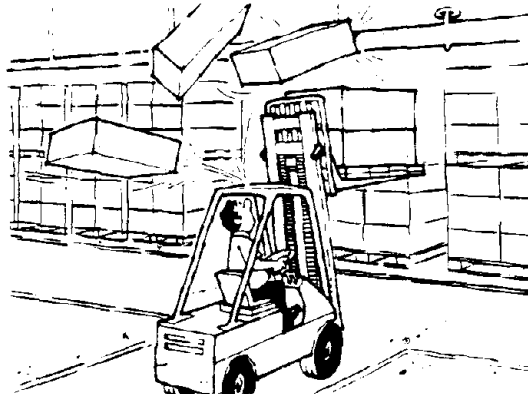
HYDRAULIC LIFT TRUCKS AND HAND TRUCKS

A hydraulic lift truck that leaks fluid must be taken out of service until it has been repaired. The leaking can cause the truck to settle after a load has been raised, and it creates obvious slipping hazards.

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

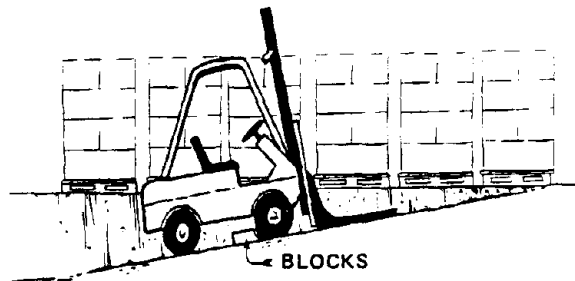
The operation of any type of powered industrial truck in an area where flammable or combustible materials (dusts, vapors, etc.) are airborne can provide the spark or hot surface (e.g., muffler on a non-electric truck) necessary for a fire or explosion. For this reason, OSHA regulations classify all truck operating areas into four types. Three types are those areas in which various kinds and degrees of fire hazards exist. The fourth type includes all other areas. Truck types allowed for each of these four categories are listed in the Code of Federal Regulations, 29 CFR 1910.178(c)(2) Table N-1. Interpretative information is available by contacting your nearest OSHA or NIOSH office (see back pages).



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 trucks. OSHA has prepared materials for use in training programs for truck operators. Others are available from truck distributors, state occupational safety and health agencies, and the National Safety Council. The following guidelines pertain to powered industrial trucks and their operations:

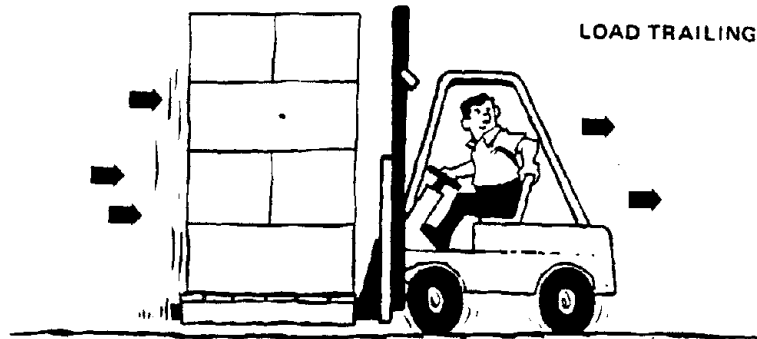
.High-lift rider trucks must be fitted with an overhead guard and load backrest extension to protect the operator from falling objects.

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 the truck is parked on an incline.



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

.If the load being carried obstructs the operator's forward view, he/she is required to travel with the load trailing.



.When unloading or loading from trucks, trailers, or railroad cars, the truck, trailer, or railroad car must be secured 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.

.Loaded vehicles must not be put into motion until the load is properly stacked and secured.

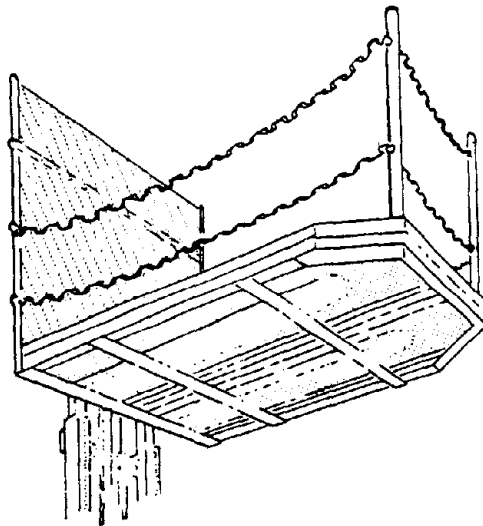
.When it is necessary to park inside warehouses, the vehicle must be parked only in approved, authorized areas.

.Drivers must be particularly careful when approaching doorways, aisle crossings, and other intersections, and sound a warning by horn or bell signal.

.Posted speed limits must be observed at all times.

.Drip pans should be placed under vehicles parked for long periods of time inside buildings.

- .Operators must keep arms, legs, and other parts of the body within the dimensions of the operators compartment.
- .Carry the load as near to the floor as possible.
- .Forktruck drivers must not stack empty pallets higher than eye level.
- .Unless the vehicle is equipped with an adequate passenger seat, and specific authorization is given, no person other than the driver shall be allowed to ride on any materials handling vehicle.
- .The Operator must not stunt drive or indulge in horseplay.
- .Only approved work platforms shall be used to lift a workman to the top of stacked materials.
- .Personnel must not be transported from one place to another on a work platform.



The following checklist should be used as a general guide for the safe and efficient operation of forklifts used for materials handling:

FORKLIFT CHECKLIST

- .Stay within the rated capacity.
- .Lift with the mast vertical or tilted slightly back, never forward.
- .Never travel with the load lifted high.
- .Do not raise or lower the load while traveling.
- .Watch rear-end swing.
- .Proceed slowly and cautiously around corners.
- .Watch blind corners--signal with the horn.
- .Use low gear when traveling down ramps.
- .Avoid sudden stops.
- .Do not descend ramps with the load in front.
- .Watch overhead clearances.
- .For better vision, drive backwards with bulky loads.
- .Watch floor strengths.
- .Use care in high stacking--watch for falling stock.

- .Be careful when handling long lengths of bar stock, lumber, etc., and watch swing. If necessary, use a walking guide.
- .Keep the load against the carriage, except when technical order procedures provide otherwise.
- .Keep the load balanced laterally.
- .Spread the forks according to load width.
- .Lower heavy loads slowly; stop them slowly.
- .Keep clear of loading dock edges.
- .Check bridge plates between loading docks, trucks, and cars for sufficient width, strength, and security.
- .When loading or unloading highway trucks or trailers:
 - a. Be sure the vehicle's brakes are set or the wheels chocked, or both.
 - b. Support the vehicle body with jacks or braces if the springs are weak.
- .Never tilt an elevated load forward, except to place it on a stock pile.
- .All objects of irregular shape must be securely chained to the forklift frame before being raised, lowered, or moved. Large, irregularly shaped objects should normally be placed on pallets for stability before being raised or transported.

- .Permit only the operator on the forklift.
- .Check foot and hand brakes for effective operation.
- .Have an adequate fire extinguisher available on the forklift.
- .Have adequate lighting on the forklift.
- .Remove ice or snow from the work area before loading or unloading, or make the area safe through the use of appropriate materials.
- .When the forklift is not in use, place it in gear, lower the forks, turn off the engine, set the hand brake, and chock the wheels. Never leave the vehicle unattended with the engine running.

HOISTS

Although the information provided in this section on hoists pertains specifically (in the OSHA regulations) to cranes, these requirements should be applied to all hoisting equipment.

- .Only personnel designated by the employer as qualified shall be permitted to operate hoists.
- .The rated load must be legibly marked on each side of the hoist. Employees should be made aware of the weight of the loads to be carried.
- .The hoist must be equipped with a self-setting brake applied to the motor shaft or some part of the gear train.
- .For powered hoists, holding brakes must be applied automatically when the power is off.
- .Hooks, chains, and all functional operating mechanisms must be visually inspected daily for any indication of damage and wear. Monthly inspection records must be maintained.
- .Hoisting, lowering, swinging, or traveling is not permitted while anyone is on the load or hook.
- .The operator must not leave his/her position at the controls while the load is suspended.
- .Loads must not be carried over the heads of people.
- .The operator must test his/her brakes each time a near-capacity load is handled. This test is done by raising the load a few inches and applying the brakes.

.The trip settings of hoist-limit switches must be determined by tests with an empty load.

.The hoist rope or chain must be free from kinks or twists and must not be wrapped around the load.

SLINGS

Each day before use, all slings and all fastenings and attachments must be inspected by a trained person designated by the employer. A thorough inspection of alloy steel chain slings must be made at regular intervals not to exceed 12 months, and a record must be kept of these inspections. Each new, repaired, or reconditioned alloy steel chain sling must be proof tested before the first use, and a certificate of the proof test must be kept.

Whenever a sling is used, the following safe practices must be observed:

- .Slings that are damaged or defective must not be used.
- .Slings must not be shortened with knots, bolts, or other makeshift devices.
- .Sling legs must not be kinked.
- .Slings must be securely attached to the load and must not be loaded in excess of their rated capacities.
- .Slings must be padded or protected from the sharp edges of the load.
- .Suspended loads must be kept clear of all obstructions and all employees must be kept clear of loads about to be lifted or already suspended.
- .Shock loading is prohibited.
- .A sling must not be pulled from under a load while the load is resting on the sling.

MACHINERY AND MACHINE GUARDING

GENERAL REQUIREMENTS FOR MACHINE GUARDING

Appropriate machine guarding must be provided to protect the machine operator and other employees in the machine area from operational hazards, such as those created at the point of operation or by in-running nip points or rotating parts. Sources of such hazards that are located seven feet or less above the ground, floor, or working platform must be guarded to prevent accidental contact. Machine operations that generate sparks or flying chips must be guarded at all heights if employees would be exposed to these hazards. Guards must be attached to the machine, if possible, or secured elsewhere if attachment to the machine is not possible. The guard must prevent the operator from having any part of the body in the danger zone during the operating cycle of the machine. Guards must not themselves create an accident hazard. Machines designed for fixed locations must be securely anchored to prevent "walking" or tipping.

The most common machine guards are:

- . enclosures (the preferred method)
- . interlocking devices
- . remote controls
- . two-hand tripping devices
- . electronic safety devices
- . removal devices (e.g., pull-away mechanisms)
- . movable barriers
- . fixed barriers

Certain guarding methods are preferable to others. The type of operation, the size and shape of the

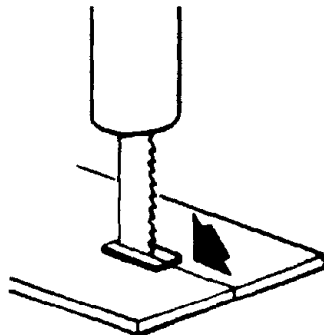
stock, the method of handling the stock, the physical layout of the site, the type of stored material, and the production requirements or limitations are important considerations. The need for flexibility in operations may also determine the method to be used.

A booklet entitled "The Principles and Techniques of Mechanical Guarding" (OSHA 2057) can be obtained by writing to your OSHA area office or to one of the OSHA regional offices listed in the back of this guide. Many equipment distributors can assist in obtaining the necessary protective devices.

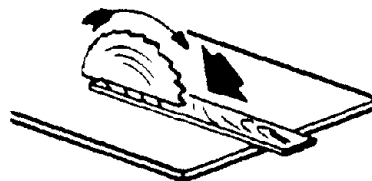
The following pages contain examples of specific equipment that must be guarded. This listing is not intended to include all equipment that may require guarding, nor are the guarding methods suggested the only ones that may be effective.

CUTTING ACTIONS

The following safety precautions apply to warehouse operations in which saws are used.



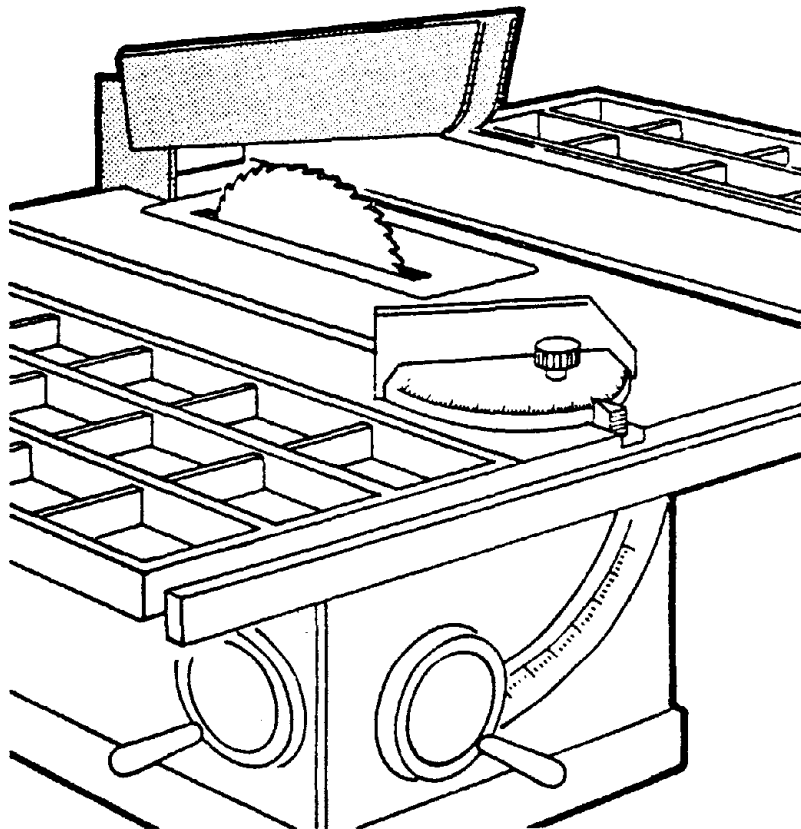
Band saw



Circular saw

TABLE SAWS

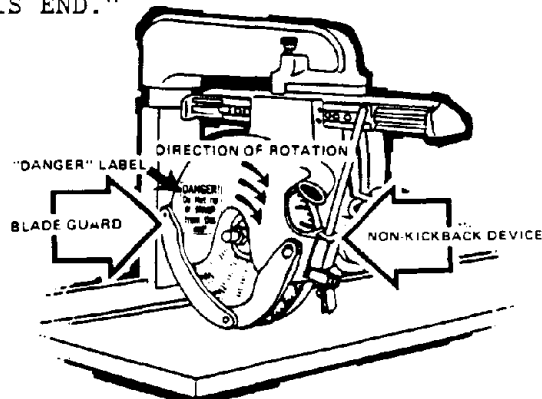
- .Table saws must be provided with a hood that covers the saw at all times.
- .Table saws used for ripping must be equipped with an anti-kickback device and spreader.
- .The exposed part of the saw underneath the table must be guarded.



RADIAL SAWS

Radial saws must be provided with:

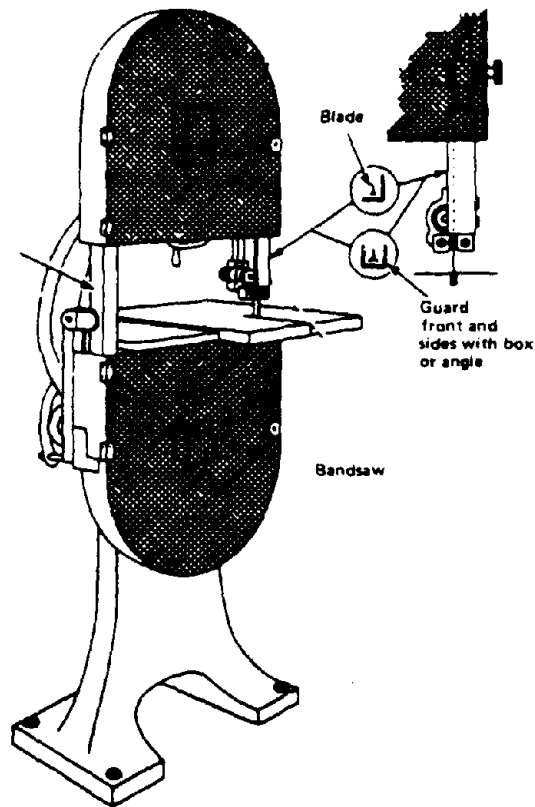
- .An upper hood to enclose the top portion of the blade down to a point that includes the end of the saw arbor. The sides of the lower, exposed portion of the blade must be guarded to the full diameter of the blade by a device that automatically adjusts to the thickness of the stock being cut.
- .Non-kickback dogs (on both sides of saw) designed to provide adequate holding power for all thicknesses of material being cut, if used for ripping.
- .An adjustable stop, limiting the forward travel of the blade beyond the distance necessary to complete the cut in repetitive operations.
- .A head which automatically returns to the starting position.
- .A marking on the hood showing the direction of the saw rotation. In addition, a permanent label must be affixed to the rear of the guard, reading: "DANGER. DO NOT RIP OR PLOUGH FROM THIS END."



BANDSAWS

Bandsaws must be provided with:

- .An enclosure for the entire blade, except for the working portion of the blade.
- .An enclosure for the wheels.
- .A tension control device.
- .A suitable guard on in-running feed rolls.



CONVEYORS, BELTS, AND ROLLERS

Many warehouse operations are handled by conveyor systems. Although such systems eliminate a great deal of physical labor, there are many hazards associated with their operation. Many workers are injured when they come in contact with improperly guarded conveyors. By implementing the following good practices, many of these injuries can be avoided.

- .No conveyor should exceed its maximum rated speed or capacity. (Each conveyor should have its rated speed and capacity conspicuously posted on it.)
- .Employees must not ride conveyors.
- .Each conveyor should be kept clear of accumulations of materials that could inhibit its safe operation.
- .Nip and shear points on conveyors, as in all other locations, must be guarded.
- .Guards must be kept in place at all times, except when the electrical power is off and the conveyor is locked out.
- .After a conveyor has been repaired, tested, or serviced, it should not be operated until all the guards and safety devices have been reinstalled and all maintenance equipment removed.
- .Conveyors must not bridge firewalls or block fire doors. All crossovers, aisles, and passageways must be conspicuously marked by suitable signs.

.A visual inspection of the entire conveyor and the immediate area should be made by the operator before putting the conveyor into operation. This check is to ensure that the action of the conveyor will cause no hazards to employees. The inspection should include an examination of at least the following:

- Feed points.
- Discharge points.
- Brakes.
- Limit switches.
- Presence of all guards and switches.
- Any parts of the conveyor exposed to employees.

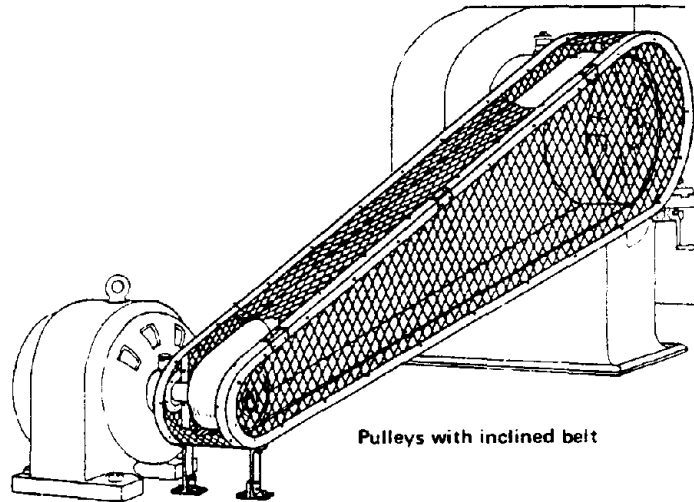
In addition to the information mentioned in this section, the following OSHA standards are among those which should be noted when guarding conveyors:

.GUARDS FOR OVERHEAD BELTS. Guards for horizontal overhead belts must run the entire length of the belt and follow the line of the pulley to the ceiling or carry to the nearest wall, thus enclosing the belt effectively. Where belts are so located as to make it impracticable to carry the guard to the wall or ceiling, the guard construction must completely enclose the top and bottom runs of the belt and the faces of the pulleys.

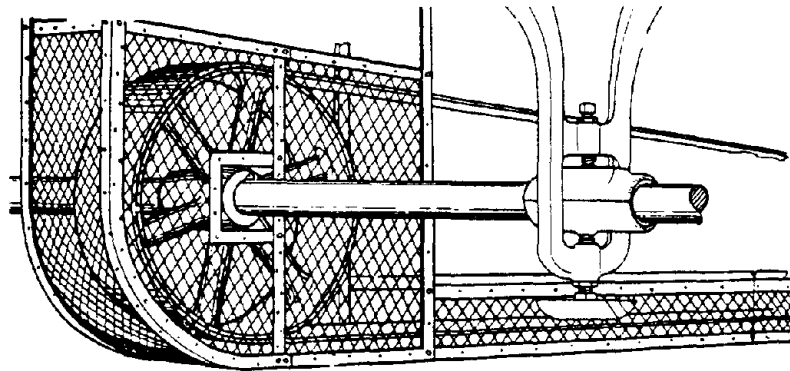
.ATTACHMENT. The guard and all its supporting members must be securely fastened to a wall or ceiling by gimletpoint lag screws or by bolts. In the case of masonry construction, expansion bolts are to be used. The use of bolts placed

horizontally through floor beams or ceiling rafters is recommended.

. SPROCKETS & CHAINS. It is required that all sprocket wheels and chains be enclosed unless they are more than seven feet above the floor or platform. Where the drive extends over other machine or working areas, protection against falling is to be provided. This paragraph does not apply to manually-operated sprockets.



Pulleys with inclined belt



Overhead horizontal belt and pulley

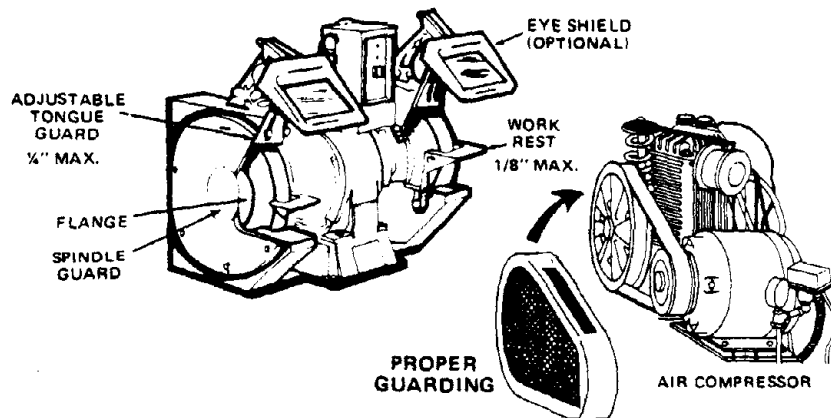
BENCH GRINDERS

Wheel safety guards must cover the spindle end, nut, and flange projections of bench grinders. Three-fourths of the area of the entire wheel should be guarded. Visors and other accessory equipment are not considered machine guards unless they are as strong as the guard itself.

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 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 can be adjusted to the wheel as it wears down. A maximum clearance of 1/4 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 seven feet of the floor (for example, floor fans), they must be guarded with grills or mesh that limits openings to not more than 1/2 inch.

AIR COMPRESSORS

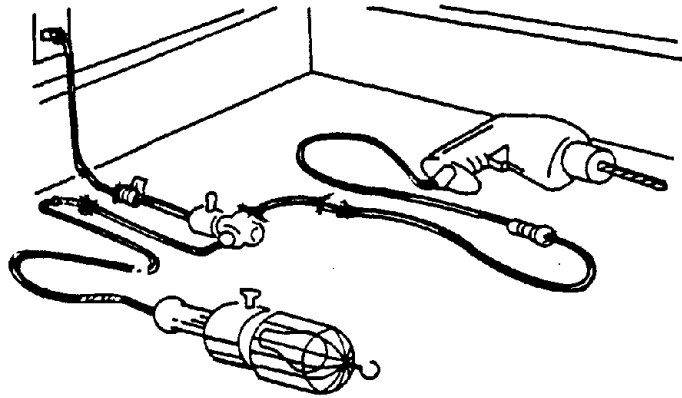
The pulleys and drive belts of air compressors must be fully enclosed.

HAND TOOLS AND PORTABLE POWER TOOLS

The following are general requirements governing the use of hand tools:

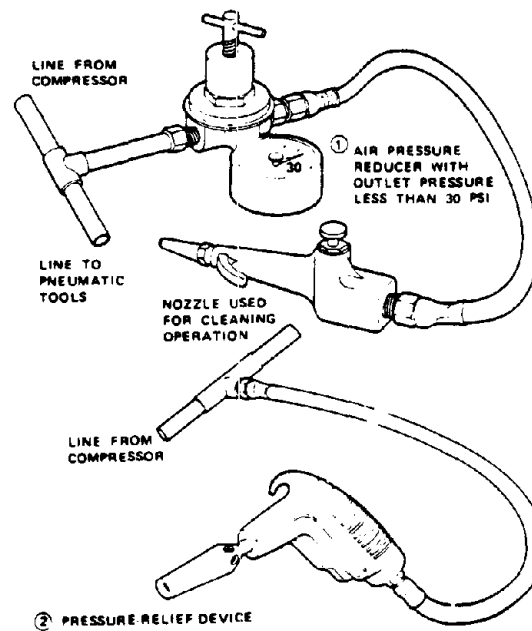
- .Each employer is responsible for the safe condition of the tools and equipment used by employees, including tools and equipment that are furnished by employees.
- .Hammers with broken or cracked handles, chisels and punches with mushroomed heads, wrenches with sprung jaws, or bent or broken wrenches should not be used.
- .Many hand-held electrical tools must be equipped with a "dead man" or "quick release" control, so that power is shut off automatically 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 to the guarding position when the tool is withdrawn from the work.

.All hand-held portable electrical equipment must either be double-insulated and identified as such or have its frame grounded.



COMPRESSED AIR

Beware of compressed air--it can be dangerous! Compressed air must never be used to blow debris from a person. Alternate methods of cleaning surfaces should be sought; however, it may be used for cleaning surfaces if there is no other acceptable method. The downstream pressure of compressed air must remain below 30 psi whenever the nozzle is dead-ended. Effective chip guarding and personal protective equipment must be used. Two acceptable methods of meeting the 30 psi requirement are illustrated.



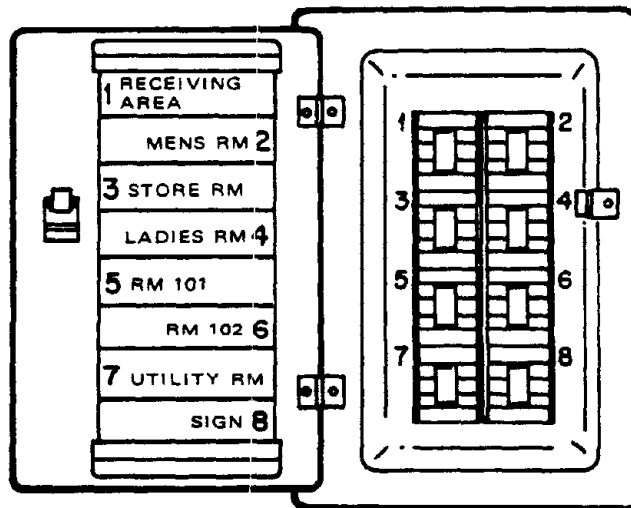
THE NATIONAL CODE (NEC)

ELECTRICAL REQUIREMENTS

More fires are caused by electrical malfunction than by any other cause, and OSHA has issued more citations for violations of electrical equipment standards than for any other standard.

The National Electrical Code (available as NFPA 70-1971, ANSI C1-1971) has been adopted as a national consensus standard by OSHA (refer to "Information Sources" in the back of this guide). The purpose of the NEC is the practical safeguarding of persons, buildings, and property from hazards arising from the use of electricity. The code contains basic minimum provisions considered necessary for safety. Your electrician should be familiar with the following NEC 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.

.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 in 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 that is 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 enclosed in suitable fixtures.

.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 made with suitable splicing devices. Splices, joints, and the free ends of conductors must be properly insulated.

RECORDKEEPING REQUIREMENTS

OSHA requires that records be kept of factual information about accidents. Employers can use these records for evaluating the success of their safety and health activities and for identifying high-risk areas of their businesses in need of attention. Employers must report within 48 hours to OSHA (or a State agency in states that have operational safety and health plans) any incident or accident which results in the hospitalization of five or more employees or in a fatality.

Employers with 11 or more employees at any time during the preceding calendar year are required to complete OSHA Forms 101 and 200 (the replacement for OSHA Forms 100 and 102) or an equivalent log. The following cases must be recorded on the OSHA Form 200 (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 whether they result in lost workdays, restriction of duties or "light duty," or 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 information equivalent to that provided on the OSHA 101. Forms 101 and 200 must be kept current to within 6 days.

An annual summary, OSHA Form 200, must be posted for the entire month of February in a place where all employees are likely to see it. Both forms (101 and 200) must be retained for 5 years, excluding the calendar year of occurrence.

A booklet, "Recordkeeping Requirements Under the Williams-Steiger Occupational Safety and Health Act of 1970," provides a supply of forms and more detailed information. It is available from OSHA regional or area offices or from the regional offices of the Bureau of Labor Statistics (see back pages).

Employers are also required to maintain accurate records of certain toxic or harmful physical agents which must be monitored or measured, and must promptly advise employees of any excessive exposures and the corrective action taken. In certain cases, physical examinations and testing are required. Examples of these agents are asbestos and ionizing radiation. Any OSHA office can supply a list of these hazardous substances and explain what records are 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 periodic 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 unhealthy 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 edition.



Washington, D.C.
1974
OSHA 2203

Peter J. Brennan
Peter J. Brennan
Secretary of Labor

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

Employers must post one of the full-sized versions (10" x 16") of this OSHA poster or a State-approved poster.

Reproduced from
best available copy.



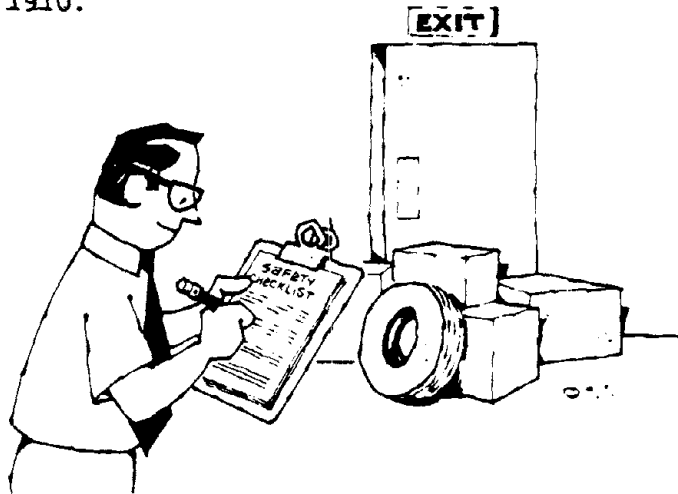
CHECKLISTS

Since safe conditions depend on vigilance for possible hazards and immediate remedial action when necessary, periodic inspections are one of the most important aspects of a successful safety and health 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 work conditions vary with each site, each business should develop a customized list, using the information found in this booklet and gained through a walk-through inspection.

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

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



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WALKING AND WORKING SURFACES AISLES
AND FLOOR (29 CFR 1910.22)

Are all places of employment kept
clean and orderly?

Are floors, aisles, and passageways
kept clean and dry; are all spills
cleaned up immediately?

Are floor holes, such as drains,
covered?

Are permanent aisles appropriately
marked?

Are wet surface areas covered with
nonslip materials?

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

Are signs present showing floor
load capacity?

Are platforms, storage lofts,
balconies, etc., that are more than
four feet above the floor,
protected with standard guardrails?

Are all platforms, lofts, and
balconies (where people or
machinery could be exposed to
falling objects) guarded with
standard 4-inch toeboards?

Are bridges provided over conveying
devices?

STAIRS (29 CFR 1910.24)

Are standard stair rails or handrails on all stairways having four or more risers?

Are all stairways at least 22 inches wide?

Do stairs have at least a 7-foot overhead clearance?

Do stairs angle no more than 50 and no less than 30 degrees?

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

Have defective ladders (those with broken rungs, side rails, etc.) been tagged as "DANGEROUS, DO NOT USE" and removed from service for repair or destruction?

Is it prohibited to use the top of an ordinary portable ladder as a step?

Do fixed ladders have at least 3 1/2 feet of extension at the top of the landing?

Is the distance between the centerline of rungs on a fixed ladder and the nearest permanent object in back of the ladder at least seven inches or more?

Do all fixed ladders have a preferred pitch of 75 degrees to 90 degrees?

Do fixed ladders longer than 20 feet have cages?

Do fixed ladders longer than 30 feet have landing platforms?

EGRESS (29 CFR 1910.36--38)

Are all exits marked with an exit sign and illuminated by a reliable light source?

Is the lettering at least six inches high with the principal letter strokes at least 3/4 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," etc.?

Are exit doors side-hinged?

Are all doors that either must be passed through to reach an exit or are the ways to an exit always free for 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
1910.94)

Is management aware of the hazards caused by various chemicals being stored?

Is employee exposure to these chemicals kept within the acceptable levels?

Are all containers, such as vats and storage tanks, labeled so employees know their contents?

Are employees required to wear personal protective equipment (gloves, eye protection, respirators, etc.) when handling hazardous materials?

If internal combustion engines are used, is carbon monoxide kept within acceptable levels?

Is vacuuming, rather than blowing or sweeping, used wherever possible for clean-up?

Are grinders, saws, and other machines that produce respirable dusts vented to an industrial collector or central system?

Is adequate ventilation provided to minimize exposure to wood dust?

Are all local exhaust ventilation systems designed and operating properly?

.Ducts not plugged?

.Belts not slipping?

.Proper air flow and volume?

OCCUPATIONAL HEALTH AND
ENVIRONMENTAL CONTROL

Air Contaminants (29CFR 1910.1000)

Is employee exposure to chemicals kept within the acceptable levels?

Are eye-wash fountains and safety showers provided in areas where chemicals such as caustics are used?

Are all containers, such as vats and storage tanks, labeled so employee know as to their contents?

Is vacuuming used, rather than blowing or sweeping dusts, wherever possible?

OCCUPATIONAL NOISE EXPOSURE (29 CFR 1910.95)

If a noise problem is suspected, are noise levels measured?

If a noise problem exists, have plans to reduce noise levels by engineering methods been made (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 protectors?

.Are annual noise surveys
made to reevaluate the
problem?

HAZARDOUS MATERIALS FLAMMABLE AND
COMBUSTIBLE LIQUIDS (29 CFR
1910.106)

Are all connections vapor- and
liquid-tight on drums and
combustible liquid piping?

Are flammable liquids kept in
closed containers (parts cleaning
tanks, pans, etc.) when not in use?

Are all spills of flammable or
combustible liquids cleaned up
promptly?

Is combustible waste material (oily
rags, etc.) stored in covered metal
receptacles and disposed of daily?

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 mechanical or gravity ventilation (at least six air changes per hour)?

Are storage cabinets for flammable liquids labeled "FLAMMABLE--KEEP FIRE AWAY"?

Is there never more than one day's supply of flammable liquids outside of approved storage cabinets or rooms?

Are LP gas storage tanks guarded to prevent damage from vehicles?

Are "NO SMOKING" signs posted on LPG-gas tanks?

PERSONAL PROTECTIVE EQUIPMENT (29 CFR 1910.132-.137)

Is employee-owned personal protective equipment, such as gloves, protective shoes, etc., adequate and properly maintained?

Do employees wear required personal protective equipment (gloves, eye protection, respirators, etc.) when handling hazardous materials?

Are ear plugs or muffs provided and worn during noisy conditions?

Is slip-resistant footwear worn?

Are hard hats or safety shoes available where falling objects could be a hazard?

RESPIRATORY PROTECTION DEVICES (29
CFR 1910.134)

Are NIOSH approved respirators
provided and worn during dusty
operations, spraying, etc.?

Is the proper respirator in use for
the hazards present? (For example,
dust masks do not protect against
solvent vapors.)

Are written standard operating
procedures available to the
employee for the selection and use
of respirators?

Is the employee-user trained in the
proper use of respirators?

Are respirators cleaned and
disinfected after each use?

Are respirators stored in a
convenient, clean, and sanitary
location?

Are routinely used respirators
inspected during cleaning?

GENERAL ENVIRONMENTAL CONTROLS
SANITATION (29 CFR 1910.141-.149)

Are restrooms and washrooms kept clean and sanitary?

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

Is all water provided for drinking, washing, and cooking suitable for drinking?

Are all outlets for water 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?

Is pest and rodent control exercised where needed?

If employees are permitted to eat on the premises, are they provided with a suitable space for that purpose?

MEDICAL AND FIRST AID (29 CFR 1910.151)

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 means provided for quick drenching or flushing of the eyes and body in areas where corrosive materials are used?

Is there a first aid kit easily accessible to the work area, with supplies readily available, inspected, and replenished?

Have first aid supplies been approved by a consulting physician, indicating that they are adequate?

Are medical personnel readily available for advice and consultation on matters of employee health?

Are emergency phone numbers posted?

FIRE PROTECTION (29 CFR 1910.156-157)

Are 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 mounted at the correct height? If less than 40 pounds, the top must be no higher than 5 feet above floor; if greater than 40 pounds, the top must be no higher than 3 1/2 feet above floor.

Have all extinguishers been serviced, maintained, and tagged at intervals not exceeding one year?

Are all extinguishers checked (by management or designated employees) monthly to see if they are in place and fully charged?

Have extinguishers been hydrostatically tested according to schedules set for the type of extinguisher?

OTHER FIRE SUPPRESSION SYSTEMS (IF APPLICABLE) (29 CFR 1910.159)

AUTOMATIC SPRINKLER

Is there at least one automatic water supply of adequate pressure, capacity, and reliability?

Are waterflow alarms provided on all sprinklers?

Are the sprinkler systems periodically inspected and continuously maintained?

Are the heads of sprinkler nozzles pointed in the direction of the potential fire?

Is the minimum clearance between sprinkler deflectors and the top of combustible materials:

.36 inches for solid piles 15 to 21-feet high?

.36 inches for piles 12 to 21 feet high with horizontal channels?

.18 inches for solid piles up to 15 feet high?

.18 inches for piles up to 12 feet high with horizontal channels?

DRY CHEMICAL SYSTEMS

Does a competent inspector make annual inspections and perform tests on all dry chemical extinguisher systems?

Are the inspector's reports kept on file?

Are visual inspections regularly made?

Are all dry chemical systems continuously maintained?

CARBON DIOXIDE (CO2) SYSTEMS (29 CFR 1910.161)

Are the CO2 systems inspected and tested yearly?

Are the cylinders weighed or pressure checked twice a year and refilled or replaced if they show a loss of 10% or more?

COMPRESSED AIR (29 CFR 1910.169)

Are pulleys and belts on compressors and motors completely guarded?

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?

Is air pressure reduced to less than 30 psi when the nozzle used for cleaning is dead ended?

Have employees been instructed that the use of compressed air to blow debris from clothing or body is prohibited because the debris can enter the body and cause serious harm?

MATERIAL HANDLING AND STORAGE (29 CFR 1910.176-.181)*

Is there safe clearance for equipment through aisles and doors?

Is stored material stable and secure?

Are storage areas free from tripping hazards?

Are storage racks inspected periodically for cracks, weaknesses, or indentations?

Are material safety data sheets available in case of exposure to toxic materials?

Have personnel been trained in clean-up procedures involving toxic materials?

Are only trained operators allowed to operate powered industrial trucks?

Is proper personal protective equipment available for use when employees are exposed to toxic materials? Have employees been trained in the use of this equipment?

Are appropriate overhead guards installed on powered lift trucks?

Is battery charging on electric units performed only in designated areas?

Are "NO SMOKING" signs posted near electric battery charging units?

Are emergency showers and eye-wash fountains available?

On units using internal combustion engines, do the exhaust gases in the room not exceed allowable limits for carbon monoxide?

Are dock boards (bridge plates) used when loading or unloading from dock to truck or dock to rail car?

Are containers of combustibles or flammables, when stacked one upon the other, always separated by dunnage sufficient to provide stability?

Are racks and platforms loaded within the limits of their capacity?

Is all storage secured against sliding or collapse?

Are all vehicles shut off prior to loading?

Are aisles designated and kept clear to allow unhindered passage?

If motorized equipment such as forklift trucks are used, are aisles permanently marked, providing sufficient clearance for passage of the equipment?

Are specifications posted for maximum approved loads for floors (except slabs with no basements)?

Are fuel gas cylinders and oxygen cylinders separated by 20 feet or a barrier 5 feet high having a 1/2-hour fire resistance rating?

Are cylinders secured and stored where they cannot be knocked over?

Are cylinder protective 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 all compressed gas cylinders legibly marked for identifying the contents?

MACHINERY AND MACHINE GUARDING (29
CFR 1910.212)

Are belts, pulleys, and rotating shafts (air compressor, saws, etc.) properly guarded?

Are chains, sprockets, and gears properly guarded?

Are all in-going nip points properly guarded?

Are rotating parts (lubrication fittings, etc.) recessed or covered with collars?

Are all pieces of equipment with an electric motor or any electrical connection effectively grounded?

Are sprockets and V-belt drives that are within reach of platforms and passageways or less than seven feet from the floor completely enclosed?

Are fans less than seven feet above the floor protected with a guard having openings 1/2 inch or less?

ABRASIVE WHEEL MACHINERY (Grinders)
(29 CFR 1910.215)

Is the work rest used and kept
adjusted to within 1/8 inch of the
wheel?

Is the adjustable tongue on the top
side of the grinder used and kept
adjusted to within 1/4 inch of the
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 mushroomed heads on chisels,
punches, etc., been reconditioned
or replaced if necessary?

Have broken hammer handles been
replaced?

Have worn or bent wrenches been
replaced?

Have deteriorated air hoses been
replaced?

Are portable abrasive wheels
appropriately guarded?

Have employees been made aware of
the hazards caused by faulty or
improperly used hand tools?

SAWS (29 CFR 1910.213)

Are there proper guards on all
saws?

Is the lower portion of the blade
on radial arm saws guarded?

Are there devices used to
automatically return the swing saw
or radial saw back to its original
position?

Are saws used for ripping equipped with anti-kickback devices and spreaders?

Does every machine have a master switch to keep it inoperative during repairs or adjustments?

Is the exposed part of the saw underneath the table properly guarded?

Are blades on bandsaws properly enclosed and guarded?

NATIONAL ELECTRICAL CODE ELECTRICAL WIRING (29 CFR 1910.309)

Have exposed wires, frayed cords, and deteriorated insulation been repaired or replaced?

Are junction boxes, outlets, switches, and fittings covered?

Does all equipment connected by cord and plug have grounded connections?

Are electrical appliances, such as vacuums, blowers, and vending machines, grounded?

Are all portable electrical hand tools grounded, unless doubly insulated?

Are breaker switches identified as to their use?

Are flexible cords and cables run only in appropriate places (not through holes in wall or ceiling, or through doorways or windows, or attached to building surfaces)?

Are flexible cords and cables free from splices or taps?

Are all conduit connections intact?

Do all extension cords being used have a ground wire?

Do all extension cords being used have appropriate wiring to carry the current being drawn?

Are multiple plug adapters not used?

In wet locations, is the electrical equipment properly protected?

Are flexible cords and cables never substituted for fixed wiring?

Are flexible cords and cables fastened so that there is no direct pull on joints or terminal screws?

Are tag-outs or lock-outs used when working on equipment?

RECORDKEEPING (29 CFR 904.2-.8)

Is employee poster (OSHA or equivalent State poster) prominently displayed?

Have occupational injuries or illnesses, except minor injuries requiring only first aid, been recorded on OSHA Form Nos. 101 and 200, or equivalent?

Has a summary of all occupational injuries and illnesses been complied at the conclusion of each calendar year and been recorded on OSHA Form No. 200, and was it posted during the month of February?

Have all OSHA records been retained for a period of five years, excluding the current year?

Has a summary of all occupational injuries and illnesses been complied at the conclusion of each calendar year and been recorded on OSHA Form No. 200, and was it posted during the month of February?

INFORMATION SOURCES

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

A12.1	Floor and Wall Openings
A14.1	Portable Wood Ladders
A54.1	Carbon Dioxide Extinguishing Systems
A58.1	Minimum Design Load
A64.1	Fixed Stairs
B15.1	Mechanical Power Transmission
B56.1	Powered Industrial Trucks
C1	National Electrical Code
O1.1	Safety Code for Woodworking Machinery
Z4.1	Sanitation in Places of Employment
Z9.2	Local Exhaust Systems
Z49.1	Welding and Cutting
Z87.1	Eye and Face Protection
Z88.1, 88.2	Respiratory Protection
Z89.1	Safety Requirements for Industrial Head Protection
A112.1	Portable Fire Extinguishers

NFPA-70-1971 National Electrical Code

NFPA-101-1973 Life Safety Code

NFPA-505-1973 Type Designations, Areas of Use,
Maintenance and Operation of Powered
Industrial Trucks

NFPA-58-1976 Storage and Handling LP Gases

NATIONAL SAFETY COUNCIL
425 North Michigan Avenue
Chicago, Illinois 60611

NATIONAL INSTITUTE FOR OCCUPATIONAL
SAFETY AND HEALTH (NIOSH)
4676 Columbia Parkway
Cincinnati, Ohio 45226

List of Criteria Documents

List of Technical Publications

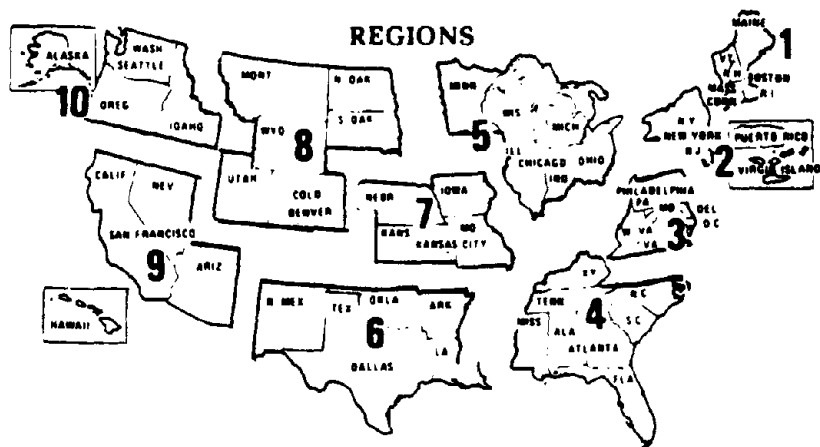
NIOSH 75-119 Certified Personal Protective Equipment

Training Division Course Schedule NIOSH and OSHA
Regional Directors (see listing in back of this book)

Trade associations, State and local governmental
agencies, 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 AND OSHA REGIONAL OFFICES

The following pages list NIOSH and OSHA regional offices. Either of these facilities serving the state can provide information on the Occupational Safety and Health Act including questions on standards interpretations, voluntary compliance information, copies of the OSHA Standards, OSH Act, Employee Rights Posting Notice, and other OSHA publications.



NIOSH REGIONAL OFFICES

DHEW, Region I
JFK Federal Bldg.
Room 1401
Boston, Massachusetts 02203
617/223-6668

DHEW, Region II
26 Federal Plaza, Room 3300
New York, New York 10007
212/264-2485

DHEW, Region III
P. O. Box 13716
Philadelphia, PA 19101
215/596-6716

DHEW, Region IV
101 Marietta Tower
Atlanta, GA 30323
404/221-2396

DHEW, Region V
300 South Wacker Dr.
33rd Floor
Chicago, IL 60606
312/886-3651

DHEW, Region VI
1200 Main Tower Bldg.
Dallas, Texas 75202
214/655-3081

DHEW, Region VII
601 E. 12th St.
5th Floor West
Kansas City, Missouri 64106
816/374-5332

DHEW, Region VIII
11037 Federal Bldg.
Denver, Colorado 80294
303/837-3979

DHEW, Region IX
50 United Nation Plaza, Rm. 231
San Francisco, CA 94102
415/556-3781

DHEW, Region X
1321 Second Ave., Mail Stop 502
Seattle, Washington 98101
206/442-0530

OSHA REGIONAL OFFICES

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

EMPLOYEE CHEMICAL PROTECTIVE CHART

Employees, first-line supervisors, and others need to know what hazards are presented by workplace chemicals and what protective measures are required to guard against overexposure. The accompanying chart is suggested as a format for analyzing the specific chemical hazards employees face. Column headings are explained in the sections below.

(see back pages).

ITEM

If the contents of chemical products are not listed by technical chemical names, those names should be requested from the supplier or customer (for example, by requesting Material Safety Data Sheets). Both common and technical names should be included in the job an anlysis. Assistance in identifying chemical components can also be obtained by contacting NIOSH

USE

Indicating each chemical product's use helps employees who handle several chemicals to determine what type of personal protective equipment is required. Frequently, employees may recognize the chemical by its use far more readily than by its technical name. This information should also be valuable for supervisors.

FORM(S) FOUND; ROUTE(S) OF EXPOSURE

Selection of both appropriate engineering and administrative controls and personal protective equipment and clothing depends on the physical forms of the substance present in the workplace--dust, liquid, vapor, fume, gas, etc. The forms in which a chemical is present in a particular application plus the nature of the required handling determine the routes of exposure--skin, inhalation, eye contact, or swallowing.

CONTROLS AND/OR PROTECTIVE CLOTHING AND EQUIPMENT
REQUIRED

Controls are recorded in this column so that supervisors and employees will know both which are necessary in which situations and what action to take if such controls require repair, adjustment, or routine maintenance.

To determine the adequacy of engineering or administrative controls and of personal protective equipment or clothing, the concentration of an air contaminant may have to be measured. Similarly, in the case of a highly toxic chemical that is readily absorbed by the skin, swipe samples from contaminated surfaces may be necessary. Sometimes blood or urine analyses will indicate whether workers have been exposed to toxic chemicals and whether the protective equipment and work practices are adequate.

POSSIBLE RESULTS OF OVEREXPOSURE

The health effects and symptoms of overexposure to a particular hazard should be listed in this column. It should also note if a chemical is a carcinogen. This information should be available from the supplier. If not, contact NIOSH (see back pages).

Effects due to short-term overexposure and those due to long-term overexposure should be separately identified. This should encourage the use of required protective equipment and the adoption of necessary safe work practices.

EMPLOYEE CHEMICAL PROTECTION CHART

Name

Job Title

Date

Period

ITEM	USE	FORM(S) FOUND IN THIS OPERATION	ROUTE(S) OF EXPOSURE	CONTROLS and/or PERSONAL PROTECTIVE CLOTHING and EQUIPMENT REQUIRED	POSSIBLE RESULTS OF OVEREXPOSURE
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KIND OF FIRE

DECIDE THE CLASS OF FIRE YOU ARE FIGHTING...

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.

APPROVED TYPE OF EXTINGUISHER

MATCH UP PROPER EXTINGUISHER WITH CLASS OF FIRE SHOWN AT LEFT

FOAM Solution of Aluminum Sulphate and Bicar-bonate of Soda	CARBON DIOXIDE Carbon Dioxide Gas Under Pressure	SODA ACID Bicarbonate of Soda Solution and Sul-phuric Acid	PUMP TANK Plain Water	GAS CARTRIDGE Water Ex-pelled by Carbon Dioxide Gas	MULTI-PURPOSE DRY CHEMICAL	ORDINARY DRY CHEMICAL

HOW TO OPERATE

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

CARBON DIOXIDE: Direct Discharge as Close to Fire as Possible. Hold at Edge of Flames and Gradually Force Stream Upward.

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

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

DRY CHEMICAL: Direct at the Base of the Fire. In the Case of Class A Fire, Follow Up by Sweeping the Dry Chemicals at Remaining Material to Prevent Re-burning.

IMPORTANT! USING THE WRONG TYPE OF EXTINGUISHER FOR THE CLASS OF FIRE MAY BE DANGEROUS!

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...



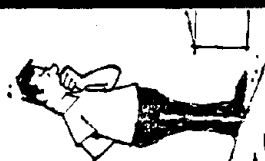
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BEWARE OF OVERSTRESS AND CARRIED



1. Approach the load and use it up length, size and shape. Consider your physical ability to handle the load.



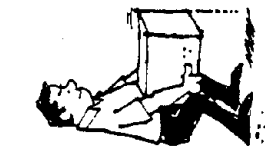
2. Place the feet close to the object to be lifted 8 to 12 inches apart for good balance.



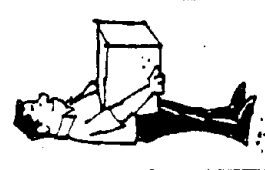
3. Bend the knees to the degree that is comfortable and get a good backhold. Try using both leg and back muscles.



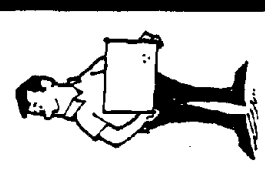
4. Lift the load straight up smoothly and evenly. Pushing with your legs. Keep load close to your body.



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



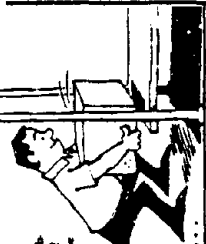
6. Turn your body with changes of foot position after looking over your path of travel making sure it is clear.



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



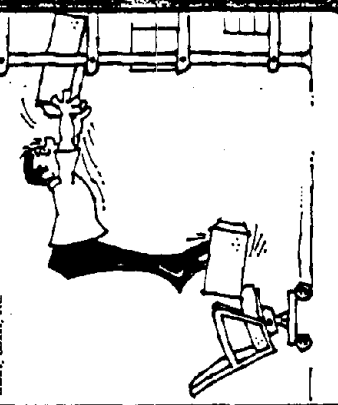
Avoid strain by storing heavy objects at least 12 inches above the floor.



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.



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.

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



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EMERGENCY INFORMATION

FIRE

Telephone Fire Department _____

Nearest Alarm Box at _____

CRIME

Telephone Police _____

INJURY/ILLNESSES

Avoid infection of minor injuries; always get medical attention or skilled first aid.

Doctor _____

Office _____ Tel. _____

Residence _____ Tel. _____

Hospital _____

Address _____ Tel. _____

Ambulance _____

Address _____ Tel. _____

(In emergencies, get medical attention and transportation elsewhere if necessary.)

In all cases of Fire, Crime, Accident, or Sickness, promptly notify:

1. Name _____ Office Tel. _____

Address _____ Res. Tel. _____

or

2. Name _____ Office Tel. _____

Address _____ Res. Tel. _____

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