

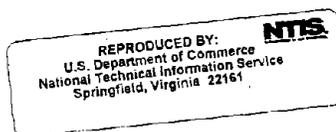


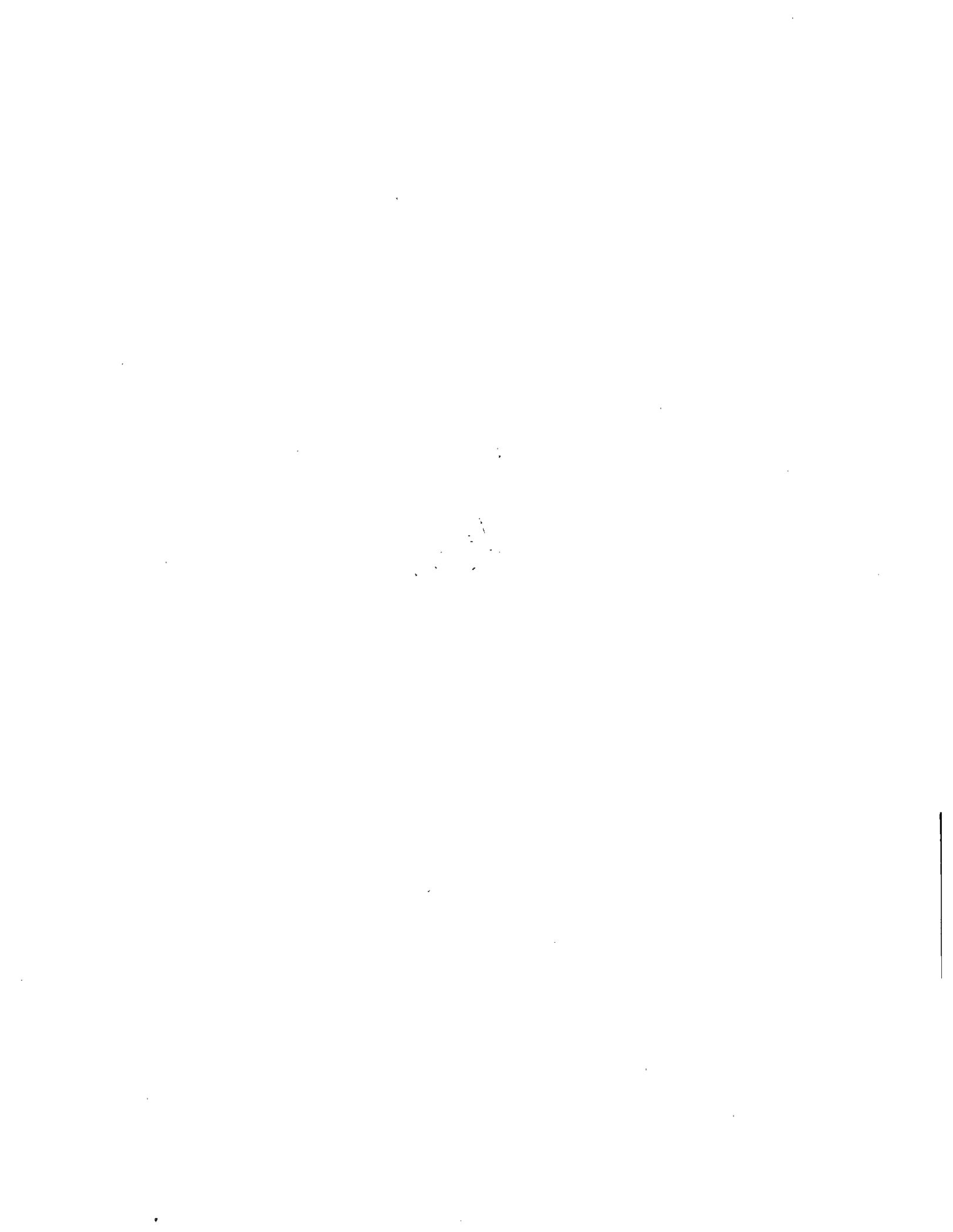
HEALTH AND SAFETY GUIDE FOR TEXTILE MACHINERY MANUFACTURERS

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

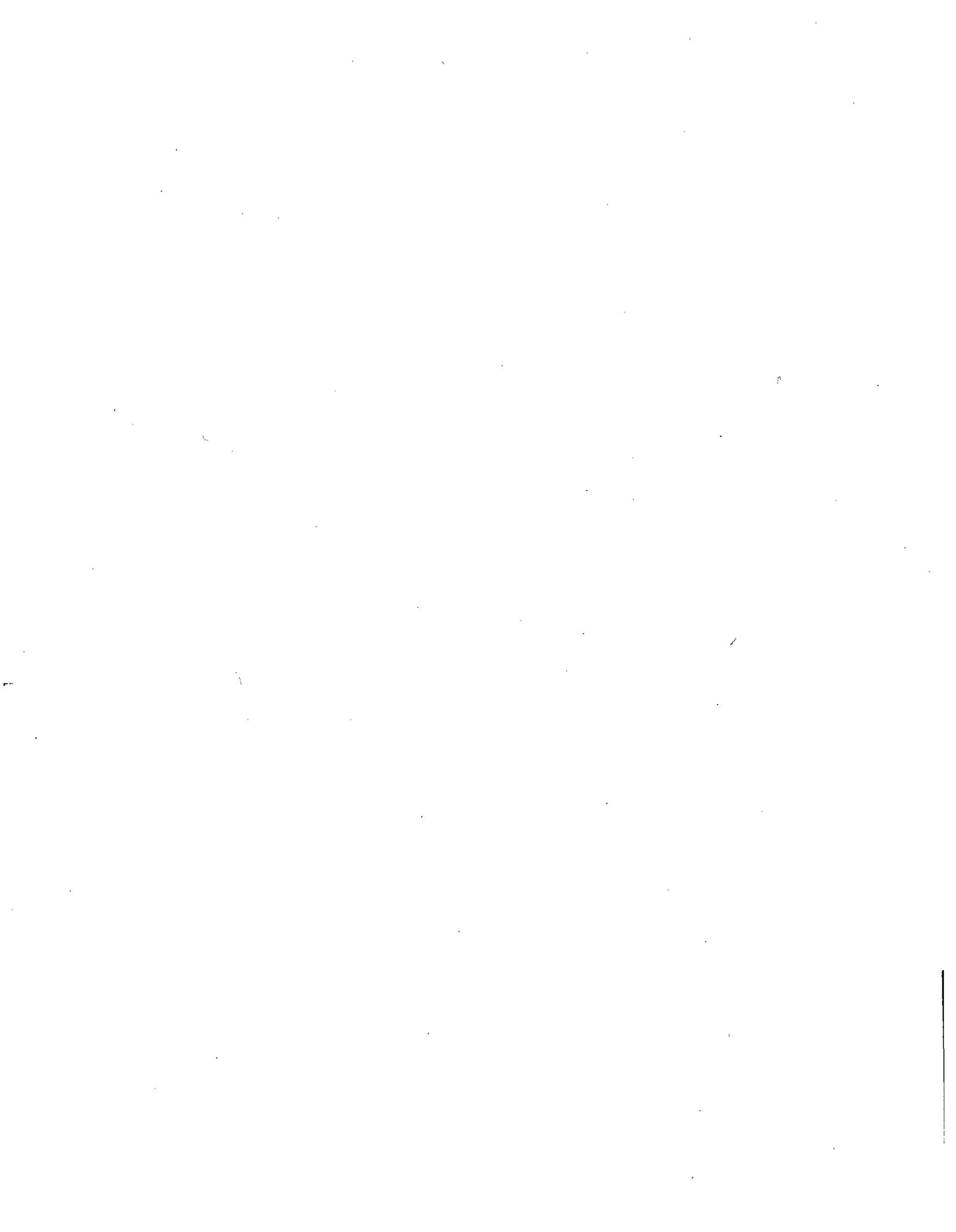
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INTRODUCTION

The Williams-Steiger "Occupational Safety and Health Act of 1970" was enacted "to assure safe and healthful working conditions for working men and women. . ." This Act established the National Institute for Occupational Safety and Health (NIOSH) in the Department of Health, Education, and Welfare (DHEW) and the Occupational Safety and Health Administration (OSHA) in the Department of Labor (DOL). The Act provides for research, informational programs, education, and training in the field of occupational safety and health and authorizes the promulgation and enforcement of standards.

As part of these activities, surveys have been made by NIOSH to determine the most common health and safety problems in small businesses. This Guide was developed for small businesses manufacturing textile machinery or making related parts and accessories for the textile industry. Included in the booklet is a "Guidelines" section, covering the general elements of a health and safety program and general health and safety procedures, and a section on "Frequently Violated Regulations."

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

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

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

Information and assistance can be obtained from NIOSH and OSHA regional offices whose addresses are given at the end of this Guide. Consultations resulting from requests for assistance will not result in a compliance visit by OSHA.



HEALTH AND SAFETY GUIDELINES

Health And Safety Program

A valuable aid to the employer in the identification of health and safety hazards is the establishment of a health and safety program. Hazards may be identified by performing inspections, interviewing employees for suggestions and complaints, promptly investigating accidents, reviewing injury and illness records, and using material from this Guide and other sources (for example, National Safety Council data sheets).

Management may assign certain safety and health responsibilities in the development of a health and safety program. Regular meetings and informal discussions can be held to discuss health and safety hazards and corrective procedures as well as injury and illness records. To ensure program success, management leadership and support are necessary. Those assigned responsibility for the program must be given the necessary authority to carry it out. Everyone in the establishment should be made aware of the program, because well-informed employees will very likely show interest and a desire to participate.



General Philosophy For Health And Safety Compliance

A thorough analysis of the workplace (see "Workplace Hazard Analysis") for health and safety hazards may reveal unsafe acts or conditions. Many conditions are covered by specific standards. For those hazardous conditions or practices which arise during the manufacture of textile machinery and are not covered by specific OSHA standards, the general duty clause of the Act applies. This clause states that "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." It is important in all cases to eliminate these "recognized hazards."

During the analysis for standards compliance, it may become apparent that the letter of the law is not being met. This may be particularly noticeable where dimensions are given for ladders, stairs, railings, etc. If it is apparent that the intent of the law is being met, a variance from the applicable standard may be requested from OSHA, instead of making changes. The decision not to make changes should only be made with the concurrence of OSHA.

When a citation is issued, it is important for the employer to have demonstrated a willingness to comply with the law by operating a safety and health program, correcting hazards in the workplace, and maintaining records of purchases, installations, and other activities promoting compliance.

Employee Training

An important part of a health and safety program is employee training. Although training needs may differ with the type of textile machinery manufactured, the following suggestions for training apply to all types of machinery manufacture:

Employees should understand the need for constant attention to their working environment, even during automatically controlled operations.

Employees should know how hazardous substances which they encounter enter the body. Substances may be absorbed through the skin, inhaled, or ingested. Employees should know the symptoms of overexposure to these hazardous substances (e.g., solvents, paints, and dusts).

Employees should be instructed in the proper handling, storing, mixing, and disposal of hazardous substances. In many cases, this information is available from the manufacturer's Material Safety Data Sheet (MSDS).

Employees should be trained in applicable emergency procedures in case of accidental leaks or spills of hazardous substances.

Employees must be trained in the proper use of protective equipment, particularly respirators (see "Personal Protective Equipment").

Employees should be trained in good personal hygiene practices. Instruct employees to thoroughly wash their faces, hands, and arms prior to eating, drinking, or smoking in order to prevent inadvertent ingestion of toxic substances.

"Good housekeeping" must be promoted. It can reduce accidents and fire hazards, and develop in employees a sense of pride in their surroundings. All employees should take part in the clean-up. They should know the hazards involved and proper clean-up procedures.

Employees must be trained in the use of forklifts, cranes, trucks, and other powered equipment. This should include safety precautions, signals, etc.

Employees should be instructed in the use of portable fire extinguishers. (Refer to the fold-out chart in this booklet.) Post the telephone numbers of the local fire department. Also, develop emergency procedures in case of fire.

First aid training must be provided for at least one worker on each shift. Approved courses are offered by the American Red Cross.

Employees should be instructed in safe lifting. An easily understood chart, "How to Lift Safely," is included in the back of this book.

General Information On Manufacturers Of Textile Machinery

The textile machinery industry is comprised of those manufacturers of fabricating and assembling machines and special parts used in the making of cloth from its basic raw materials. Companies which actually manufacture finished pieces of textile processing machinery such as carding machines and looms, or finishing machinery such as printing and dyeing machines, comprise only a small portion of the total number of businesses in the textile machinery category. A majority of companies are small businesses making specialized parts or accessories for textile machinery (e.g., spindles, bobbins, shuttles, and heddles).

According to NIOSH surveys, the most common injuries in the textile machinery manufacturing industry are eye injuries, mashed fingers and toes, cut hands and fingers, and strained muscles.

Most eye injuries were caused by flying metal or wood particles. Splashes of liquid chemicals and welding flash also caused eye damage. Fingers were crushed or amputated in the nip points of rollers and gears and at the point of operation of metal stamping machinery. Lacerations and abrasions of hands and fingers were caused by contact with saw blades and abrasive grinders. Foot and toe injuries resulted from dropping heavy objects. Improper lifting practices caused strained muscles.

Occupational Health and Environmental Control

A large variety of processes are used in the manufacture of textile machines and parts. Some of the major processes are general machine shop work, metal stamping, sheet metal work, woodworking, electroplating, and foundry operations.

GENERAL MACHINE SHOPS

Mechanical and electrical hazards are the most common safety problems in machine shops. All drive belts on equipment such as grinders, saws, and air compressors must be fully guarded. Grinders must be equipped with tool rests, adjustable tongue-guards, and spindle guards. Table saws and radial arm saws must be guarded. Electrical equipment must be grounded or double-insulated, and all extension cords must be of the three-wire type and of sufficient capacity to safely carry the required current.

Cutting fluids and organic solvents are the most common sources of health hazards in machine shops. Skin contact with these materials can cause inflammation. Inhalation of high concentrations of solvent vapors can affect the central nervous system, acting as a depressant or as an anesthetic.

METAL STAMPING

The primary hazard in metal stamping operations is the point of operation of the machinery. Effective machine guarding must be provided.

SHEET METAL OPERATIONS

A serious danger of hand and finger damage exists in sheet metal operations during cutting, bending, and punching. Proper guarding of machinery must be provided. Eyes must be protected from flying chips and particles.

WOODWORKING

Woodworking operations in the textile machinery manufacturing industry include the production of wooden loom components (such as harnesses and shuttles), bobbins used in yarn processing, and aprons on pickers and opening machines. Hazards of woodworking operations include cutting equipment, wood dust, and excessive noise. Proper guarding and careful operation of woodworking machinery is necessary to prevent lacerations and amputations of fingers and hands. Control of wood dust by ventilation is necessary to prevent excessive worker inhalation of dust and to control fire hazards. An expanded discussion of hazards associated with woodworking operations can be found in the NIOSH Health and Safety Guide for Millwork Shops (Publication Number 76-111).

ELECTROPLATING

Employees working in electroplating shops may be exposed to many toxic substances, including solvents, acids, alkalies, and plating solutions. Skin contact with these materials can lead to inflammation and, depending on the solution concentration, may cause rapid corrosive action. Some plating solutions and solvents can be absorbed through the skin and into the blood stream, thus exposing all body systems. Splashes into the eyes may cause serious eye damage. Wet and slippery walking surfaces pose a danger of slips and falls. Proper eye, face, and skin protection, as well as effective ventilation of plating tanks holding toxic substances, will be necessary in electroplating of metals. An expanded discussion of hazards associated with electroplating operations can be found in the NIOSH Health and Safety Guide for Electroplating Shops (Publication Number 75-145).

FOUNDRIES

Foundry operations are necessary to produce castings for textile machines and parts, and for repair and replacement of used parts. Workers may be exposed to numerous toxic substances such as silica dust, metal fumes, carbon monoxide, resins (formaldehyde, urethane, and epoxy), core oil and acrolein, aldehydes, and solvents. Additional workplace hazards are heat stress, excessive noise, and burns from molten metal. Engineering controls, particularly local exhaust ventilation, and use of personal protective equipment, primarily face protection and gloves, will be required in many phases of foundry operations. Further information concerning foundry operations can be found in the NIOSH Health and Safety Guide for Foundries (Publication Number 76-124).

In some cases, health hazards are not recognized because some materials used in manufacturing are identified only by trade names. Also, some materials contain mixtures of substances, making identification still more difficult. If the composition of a material cannot be determined, the information should be requested from the manufacturer or supplier. In many instances, they can provide Material Safety Data Sheets for the products. These sheets contain information such as hazardous concentration levels and physical characteristics of the substance, requirements for personal protective equipment, emergency procedures, and reactivities with other substances.

Workplace Hazard Analysis

In identifying occupational health hazards, job hazard analyses should be made, showing the substances used, the number of employees at risk, products formed, and any by-products generated. The form of the products and by-products should be noted, i.e., a liquid, dust, vapor, mist, gas, or fume. The most likely routes of entry should also be noted, i.e., by mouth, skin, or inhalation. Methods of controlling exposure should then be noted.

A job hazard analysis may be made for each operation, or may be done by department. The survey should evaluate present conditions. Related activities, such as maintenance and service operations, should also be examined for health hazard potential. Some examples of *un-suspected* hazards are:

- Welding performed around chlorinated materials, causing the formation of toxic gases in addition to welding fumes.
- Use of forklift trucks with internal combustion engines, generating carbon monoxide and other hazardous exhaust gases.
- Mixing of certain cleaning agents, sometimes forming chlorine and other poisonous gases.

After completing the job survey, evaluate all exposure substances listed for the hazard potential. You should also determine if present controls are adequate. Material Safety Data Sheets and toxicology references can be used for the initial evaluation. Measuring air contaminant levels and evaluating controls (particularly ventilation) may require outside consultation in some cases. After the evaluation is completed, any required controls should be provided.

The following job health hazard analyses represent a survey of a spray painting operation in a finishing machine manufacturing plant and a partial workplace survey of a spinning machine manufacturer.

WORKPLACE HEALTH HAZARD ANALYSIS

Department	Job Description	Exposure Substance(s) (chemical or trade name)	Form(s)	Control	Remarks
32-B	Shipping clerk	Combustion products- propane xylene	G L V	GV None GV	from forklift ink solvent
46	Plater	HCrO ₄ (Chromic acid) H ₂ SO ₄ (Sulfuric acid)	M L	LV G (polyvinyl alcohol) O (apron) O (eyewash)	eyewash is obstructed, should be relocated
12	Punch press operator	Noise (95-100 dBA) Oil, other	L	None	from compressed air nozzle oil on sheet metal
22	Welder and cutter - gas	Acetylene Decomposition products of flux Steel oxides Infrared radiation	G F F	GV GV GV FG (leather)	from gas flame

JOB HEALTH HAZARD ANALYSIS

Operation: _____

Page: _____

Date: _____

Number of employees	Job title	Exposure substance	Form ¹	Route of entry ²	Control ³
4	Spray painter	No. 4 red primer	M	I	LV
			V	I	LV
			L	S	G (rubber)
				S	O (apron)
		Xylene	L	S	G (rubber)
					O (apron)
			V	I	LV
			M	I	LV

1) Form: D = dust, L = liquid, V = vapor, G = gas, F = fume, M = mist

2) Route of entry: S = skin, I = inhalation

3) Control: LV = local ventilation, GV = general ventilation, R = respirator (type),
G = gloves (type), F = face protection, O = other protection (type)

Control Methods

Various control methods can be used to prevent or reduce employee exposure to air contaminants. Some of these methods, which can be used singly or in combination, are:

- **Substitution** of less toxic materials—use of 1,1,1-Trichloroethane for carbon tetrachloride.
- **Change of a process**—e.g., an operation performed manually, now automated.
- **Isolation**—placing the hazardous process in a separate room or in a corner of the building to reduce the number of persons exposed.
- **Ventilation**—either local exhaust ventilation where contaminants are removed at the point of generation, or, if the air contaminant has a low order of toxicity, general dilution ventilation (see “Occupational Health and Environmental Control”).
- **Administrative control**—as a temporary measure, limiting the total amount of time an individual is exposed to a health hazard and rotating two or more workers each shift.
- **Training and education** of employees—telling employees what hazards they are exposed to and how to reduce or limit exposure (see “Employee Training”).
- **Personal hygiene**—this cannot be overemphasized. Employees should wash their hands before eating and they should not be permitted to eat around toxic chemicals or in contaminated areas. If chemicals such as caustics, epoxies, and resins get on the skin, they should be washed off immediately. Clothing should be changed and washed daily if it becomes contaminated with toxic chemicals, dusts, fumes, or liquids.
- **Personal protective equipment**—use of such items as respirators, hearing protection devices, protective clothing, and protective equipment (see “Personal Protective Equipment”).

Power Tools

Employees who operate power tools should be instructed to:

- Know the application, limitation, and potential hazards of the tool used.
- Select the proper tool for the job.
- Remove adjusting keys and wrenches before turning on tools.
- Not use tools with frayed cords or loose or broken switches.
- Keep guards in place and in working order.
- Have ground prongs in place or use tools marked "double-insulated."
- Keep working areas free of clutter.
- Keep alert to potential hazards in the working environment such as damp locations or the presence of highly combustible materials and flammable vapors.
- Dress properly to prevent loose clothing from getting caught in moving parts.
- Use safety glasses, dust or face masks, or other protective clothing and equipment when necessary.
- Not surprise or distract anyone using a power tool.

FREQUENTLY VIOLATED REGULATIONS

This section outlines the OSHA regulations which are most applicable to general plant conditions and operations. The important points of each standard are summarized and listed in the same sequence as the OSHA Safety and Health Standards (29 CFR 1910).

Some of these standards may not apply to your particular operations, but additional standards may also be applicable. The control methods presented are only brief, general suggestions as to how hazards may be corrected. Further assistance may be obtained from your state Occupational Safety and Health agency, Regional NIOSH Consultant, or OSHA Area Office. Consultations with OSHA compliance officers or NIOSH regional industrial hygienists are encouraged and will not result in a compliance inspection of your facility. The addresses for the NIOSH regional and OSHA area offices are listed at the end of this booklet. For detailed information on control of problems such as noise, air contaminants, and machine guarding, when specific designs must be implemented, you may need the services of a professional consultant.

In December 1977, the Occupational Safety and Health Administration proposed the elimination of a group of standards included under the General Industry Standards. These standards were to be removed because they were judged to contribute little to the health or safety of employees. Throughout this Guide, the standards under consideration for elimination are indicated.

Walking and Working Surfaces

General Requirements

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 scrap, chips, oil spills, and other debris.



Areas which are constantly wet should have non-slip surfaces or mats where employees must walk or work.

Every floor, working place, and passageway must be maintained free from protruding nails, splinters, holes, and loose boards.

Where mechanical handling equipment (such as lift trucks) is used, sufficient safe clearance must be provided for foot and vehicular traffic.

No obstructions that could create a hazard are permitted in the aisles.

All permanent aisles must be marked and easily recognizable.

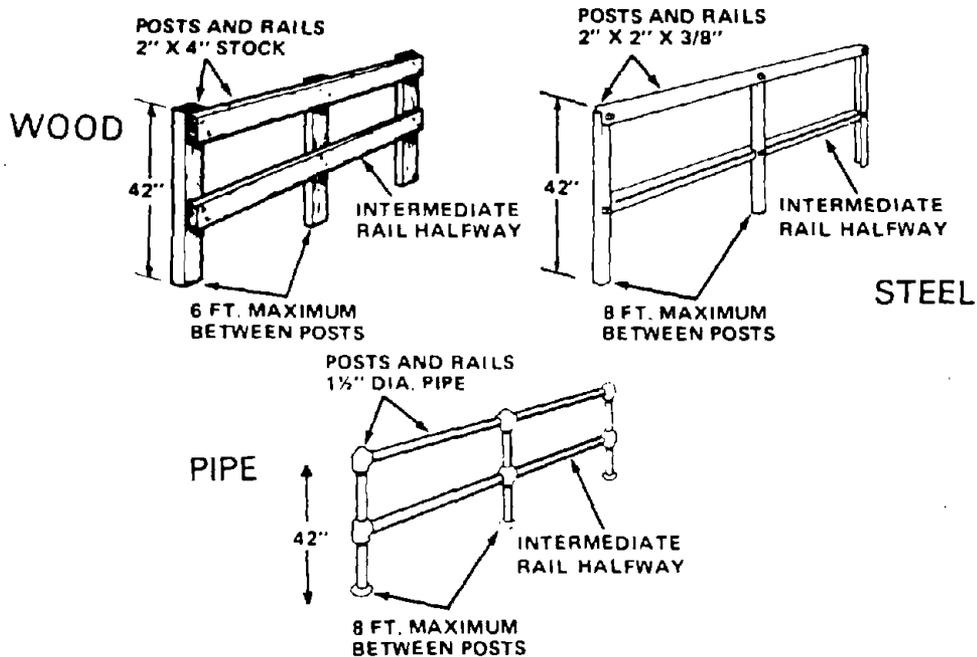
Floorload capacities must be posted in a readily visible location (except for slab floors with no basement). (OSHA may eliminate this posting requirement. Check with your OSHA area or regional office for more information.) The floorload capacity is the maximum weight which can be safely supported by a floor, expressed in pounds per square foot. If this information is not available, and when floorload capacity is in doubt, a competent engineer should be consulted.

The Standard Guardrail and Toeboard

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

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

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



- For wood railings, the rails and posts must be of at least 2 x 4-inch stock with posts spaced not more than 6 feet apart.
- For pipe railings, rails and posts must be at least 1-1/2-inch outside diameter pipe with posts spaced not more than 8 feet apart.
- For structural steel railings, the posts and rails must be of 2 x 2 x 3/8-inch angles or other metal shapes of equivalent strength with posts spaced not more than 8 feet apart.

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

Fixed Industrial Stairs

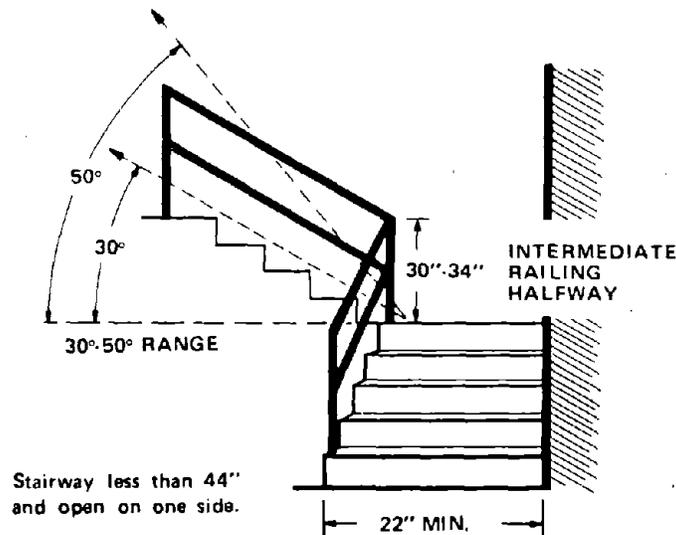
Riser height and tread width must be uniform throughout any flight of stairs.

All treads must be reasonably slip resistant.

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

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

The angle to the horizontal made by the stairs must be between 30° and 50°.



The vertical height of a stair railing must be 30 to 34 inches, and it must be of construction similar to the standard guardrail.

All stairs should be adequately lighted.

If the tread is less than 9 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, at least 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, an intermediate stair railing located midway is required.

Portable Ladders

Portable ladders must be maintained in good condition at all times with tight joints, securely attached hardware and fittings, and freely operating movable parts. They should be kept coated with a suitable protective material. (OSHA may eliminate the preservative standard. Contact your OSHA area or regional office for more information.)

All portable 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 equipment must not be used.

Ladders should be stored where they will not be exposed to the elements; 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.

All ladders must be placed so that they have a secure footing. They may not be placed on boxes, barrels, boards, bricks, or other unstable bases to obtain additional height. Nonslip bases should be used.

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 3/4 inch. Rungs of wood ladders must have a minimum diameter of 1-1/8 inches.

Rungs must be at least 16 inches wide, be spaced no more than 12 inches apart, and be free of splinters and burrs.

Ladders, when their location so demands, must be painted or treated with a preservative to resist deterioration.

The preferred pitch for safe descent is 75° to 90°, unless caged. Ladders with 90° pitch must have a 2-1/2-foot clearance on the climbing side. There must be a 3-foot clearance on ladders with a 75° pitch.

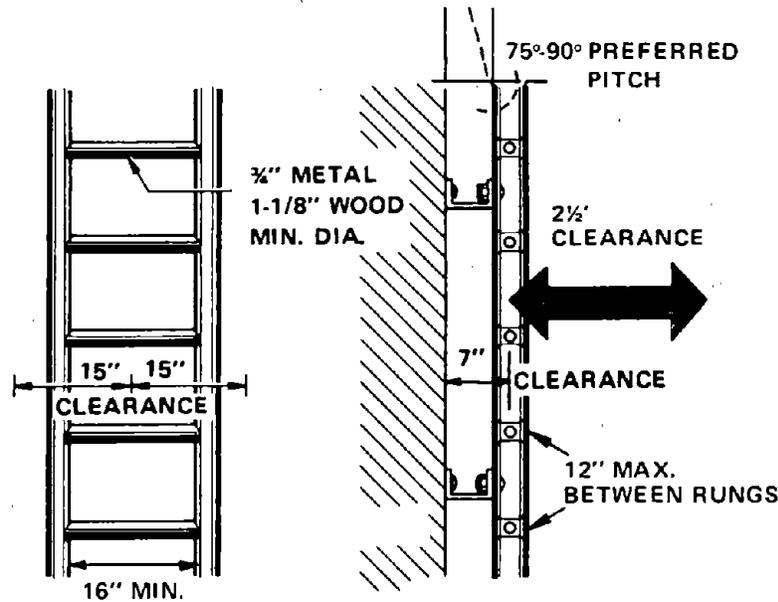
There must be at least a 7-inch clearance in back of the ladder to provide adequate toe space.

Ladders must have cages if they are longer than 20 feet.

Landing platforms must be provided on ladders greater than 20 feet long. A platform is required every 30 feet for caged ladders and every 20 feet for unprotected ladders.

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

There must be a clear width of 15 inches on each side of the center line of the ladder, unless the ladder is equipped with a cage or well.

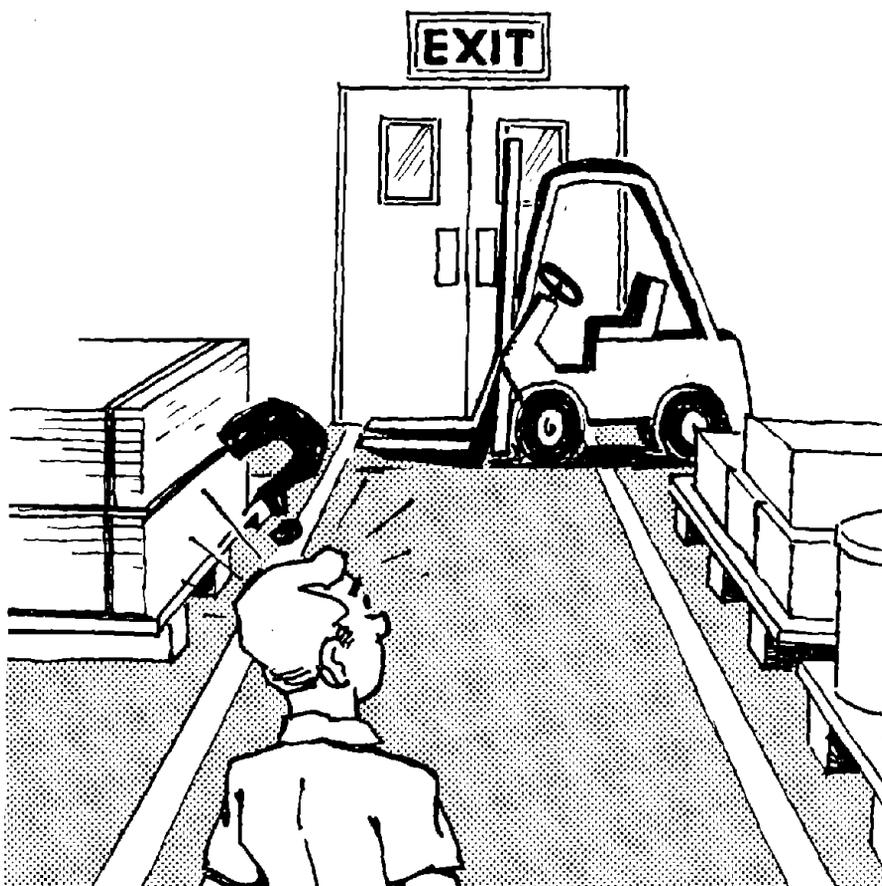


Exits and Exit Markings

General Requirements For Exits

The exit route must lead to a public way.

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



Exit access must be arranged so that it is unnecessary to travel toward any area of high hazard potential in order to reach the nearest exit (unless the path of travel is effectively shielded by suitable partitions or other barriers).

A door from a room to an exit, or to a way of exit access, must be of the 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 an area of high hazard potential.

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

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.

Size and Placement of Signs

Every exit must have 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 with a sign indicating their actual use, e.g., "STORAGE ROOM" or "TO BASEMENT."



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

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

Occupational Health And Environmental Control

The wide variety of production activities in the manufacture of textile machinery gives rise to the presence of many harmful vapors, gases, mists, and dusts. Exposure by inhalation can occur during degreasing operations, deburring and grinding operations, welding operations, and foundry and plating operations. Skin may come into contact with degreasing solutions, cutting oils, phenolic resins, and plating solutions.

OSHA has established standards which set legal limits of employee exposure to airborne concentrations of many of these substances. These standards are listed in the air contaminants section of the OSHA General Industry Standards, 29 CFR 1910.1000. These standards are available as OSHA Publication 2206 and may be obtained by contacting one of the OSHA regional offices listed at the back of this booklet. It is the responsibility of the employer to make sure that employees are not exposed in excess of these standards. Often this will require professional industrial hygiene consultation. Check the "Information Sources" section at the back of this booklet for sources of consultation.

A brief discussion covering the major health hazards found in the textile machinery manufacturing industry, with general recommendations for control, is presented below:

ACETONE

Acetone is sometimes used to remove residual oil from sheet steel before it is processed. In high concentrations, acetone will irritate the eyes, nose, and throat, and may cause headache and drowsiness. In general, under conditions of industrial handling, acetone is a low health hazard. Because of its flammability (Flash Point + 0°F), however, acetone should be handled and stored with extreme care.

SOLVENTS

Employees may be exposed to vapors of various organic solvents (e.g., trichloroethylene, perchloroethylene, and 1,1,1-trichloroethane).

These solvents are found in paints, lacquers, and resins. They are also used in cleaning operations. Typical operations would be vapor degreasing and dip cleaning. Inhalation of these and other organic solvent vapors can cause dizziness, headache, sensations of drunkenness, and irritation of the nose, throat, and lungs. Excessive exposure to some solvents can also result in liver and kidney damage. All cleaning with solvents should be done in well-ventilated areas. Those vapor degreasing tanks using cooling coils to condense vapors should be checked periodically for proper operation.

Organic solvents can also dissolve the natural, protective skin oils, causing primary irritation dermatitis and localized skin injury. This makes the skin vulnerable to other harmful substances. Some solvents can enter the body directly by skin absorption, which may cause systemic poisoning.

Employees who handle solvents should wear protective gloves which are impervious to the solvent, and should use other suitable protective clothing to reduce skin contact with the solvent. Good personal hygiene is also important in preventing skin problems associated with solvent contact.

Some degreasing agents (most notably trichloroethylene) can decompose under the influence of ultraviolet radiation from welding operations and form phosgene, a highly toxic gas. Therefore, all welding operations should be conducted well away from any degreasing operations.

The use of organic solvents also presents fire and explosion hazards because of the flammability and volatility of these materials. Cleaning operations should be conducted in well-ventilated areas and away from heat sources. All electrical equipment used near cleaning operations should be properly grounded to reduce the risk of sparks igniting a fire.

RESINS, GLUES, AND ADHESIVES

Plastic resins, glues, and adhesives are used in textile machine manufacturing. These compounds may contain resins such as epoxies and phenol-formaldehyde polymers. Resins used and applied in liquid form may contain several hazardous components, including solvents, catalysts, accelerators, and, sometimes, fiberglass or asbestos. Most of these substances can produce dermatitis upon contact with the skin and respiratory irritation upon inhalation of vapors. Some of these substances can also induce allergic sensitization. Employees may work

with resins for a considerable time without any problems and then suddenly develop allergic reactions. Once the employee becomes sensitized, exposure to even very small quantities on exposed skin or through vapor inhalation may produce a severe type of dermatitis or severe shortness of breath and asthma-like symptoms. Gloves and aprons should be worn when handling resin compounds or their catalysts. Operations involving the use of resins and catalysts should be carried out in well-ventilated areas.

WOOD DUST

Wood dust, if not removed at the source of generation, can present a health, as well as an explosion hazard. Some wood dusts, especially if the wood has been painted or chemically treated, can be toxic or cause allergic reactions in workers. High concentrations of wood dust also make good housekeeping difficult. The best control method for wood dust is local exhaust ventilation with subsequent collection by cyclones or fabric filters.

CUTTING FLUIDS

Cutting fluids are widely used in machine shop operations to dissipate heat and lubricate metal surfaces during metal cutting and machining processes. Cutting fluids can remove surface oils and fats from the skin, causing the skin to become dry, cracked, and susceptible to infections. Suspended particles or shavings in the cutting fluids have an abrasive action on the skin, causing cuts or scratches. Bacteria can then enter the tissue and cause infections.

Skin problems from cutting oils can be prevented through personal hygiene and personal protective clothing. Skin should be cleansed with mild soap and lukewarm water. Waterless hand cleaners can also be used, but sometimes these cleaners can irritate the skin. Raw solvents should never be used for skin cleansing. To prevent skin contact with cutting oil, protective clothing, including shirts with long sleeves and gloves, should be worn. Splash shields on machinery can also help in reducing employee exposure to cutting oils. Another method of control for oil dermatitis is proper filtering of oil to remove abrasive particles, and the treatment of the oil with germicidal agents to reduce bacterial count.

Inhalation of oil mists may cause irritation of the mucous membranes. Inhaling oil mists in high concentrations can lead to lipid

pneumonia, a lung inflammation caused by direct contact of the lung surface with the oil. Operations generating excessive oil mist should use local exhaust ventilation to remove the mist at the point of generation.

CARBON MONOXIDE (CO)

This colorless, odorless gas can be produced by industrial trucks using gasoline or liquefied petroleum. Symptoms of excessive carbon monoxide exposure include headache, fatigue, poor judgement, shortness of breath, weakness, and dizziness. Properly maintained combustion equipment can help prevent the generation of carbon monoxide. The use of battery-powered industrial trucks to reduce CO exposure should also be considered.

WELDING FUMES AND BY-PRODUCTS

Certain hazards are common to most arc welding processes. Principally, these are damage to the eyes and skin from infrared and ultraviolet radiation, molten metal, and the electric arc; burns from contact with hot metal or sparks; adverse physiological effects from breathing metal fumes and gases; accidents from materials handling; and electrical shock.

Eye exposure to ultraviolet radiation from the arc can result in a condition known as "welder's flash" or "arc eye" - an irritation with a sensation of sand in the eyes. These flash burns are very painful and repeated exposure may result in permanent eye injury. Overexposure to ultraviolet radiation may also cause severe skin burns. Infrared radiation from the molten metal produces a sensation of burning on the skin, but is usually not of sufficient intensity to cause permanent skin damage.

The hazard potential from the fumes and gases generated by a welding operation depends upon the chemical composition of the materials being welded, the concentrations of the chemicals in the worker's breathing zone, and the duration of exposure. Ozone and the oxides of nitrogen are the principal toxic gases produced by the arc welding process. Ozone is produced by the electric arc moving through air. Both ozone and oxides of nitrogen produce irritation of the deep lung and upper respiratory tract.

Arc welding hazards can be controlled by using effective ventilation,

by following safe working practices, and by using respirators and personal protective equipment. Welders' helmets and goggles with proper filter plates and filter lenses must be worn during arc welding to protect welders from harmful rays and from flying sparks and debris. All welders should wear flameproof, gauntlet-style gloves. Flameproof aprons made of leather or other suitable material may also be desirable as protection against radiant heat and sparks.

Spray Painting

Most spray painting processes use two methods of application. In the air process, compressed air is driven across the mouth of the paint outlet. This draws the paint out and produces an air/paint mist from the jet of the spray gun. In the airless process, pressure is applied directly to the paint which is forced out of the nozzle of the spray gun.

Typically, paint is composed of a binder, a pigment to provide color, a solvent to regulate viscosity, and a variety of additives to give special characteristics. Binder materials include linseed oil, polyesters, epoxies, polyurethanes, and water. Pigments include titanium dioxide (white), iron oxide (red), chromium oxide (green), carbon black (black), and lead chromate (yellow). (Lead chromate is rarely used because of its implication as a carcinogen.) Solvents used are petroleum distillates, toluene, and methyl ethyl ketone. Special additives include fungicides and corrosion inhibitors.

Health hazards from spray painting result from the inhalation of the mists and vapors generated and from ingestion of hazardous paint constituents. All spray painting operations should be conducted in a spray booth (see section on "Spray Booths"). If the operation is a small one, spray painting should be conducted in a well-ventilated area. All spray painters should wear protective clothing (smock, head covering, and gloves), and have immediate access to approved respiratory protective equipment, as needed.

When purchasing a particular paint, the employer should request a Materials Safety Data Sheet. The employer should read this sheet closely to determine any special precautions or handling requirements needed.

Heat Stress

The temperatures in plants manufacturing textile machinery are normally below the maximum that the body can tolerate. The limit may be exceeded during hot weather, however, when doing heavy labor.

Early symptoms of heat stress are weakness, extreme fatigue, dizziness, nausea, headache, and thirst. More advanced symptoms are arm, leg, and stomach muscle spasms; irregular or increased heart beat; extreme thirst; and fainting. Further exposure to heat may result in unconsciousness.

If the employee notices any of these signs, he should move to a cool place, rest and drink small amounts of cool water. If symptoms persist, prompt medical attention should be sought.

To prevent heat stress, proper clothing must be worn. Reflective clothing will reduce the amount of radiant heat reaching the body. Employees should drink plenty of fluids and increase their intake of salt. Lack of water reduces the cooling effect of perspiration; lack of salt interferes with the proper functioning of the body's systems. Get as much cool air into the work area as possible—open windows and keep the ventilation passage clear. One of the best ways to avoid heat stress is acclimatization. If the body is allowed to accustom itself to high heat gradually—that is, a short period the first day, a longer period the second day, and so on—within a week or so, a full shift of hard work in a hot area should produce few ill effects. Keeping in good physical condition will help the body to adjust.

Control Methods

When employees are exposed to hazardous concentrations of airborne contaminants, exposure must be reduced to acceptable levels by either engineering or administrative methods. Respirators are acceptable controls only while engineering controls are being put into effect, or if engineering controls are not feasible.

The primary methods of controlling exposure are substitution of less hazardous substances or processes and mechanical exhaust ventilation. Isolation and automation can also be used to reduce exposure to hazardous substances.

SUBSTITUTION

Substitution, as it applies to the use of solvents, may have several advantages. For example, substitution of a petroleum naphtha for xylene may reduce the overall toxicity of the formulation. If the substitution of a substance raises the flash point of the formulation to above 100°F, the formulation may be taken out of the flammable liquid class, reducing the fire hazard and easing storage requirements.

While the substitution principle has limited uses, it should be used wherever possible to reduce the hazard potential.

MECHANICAL EXHAUST VENTILATION

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

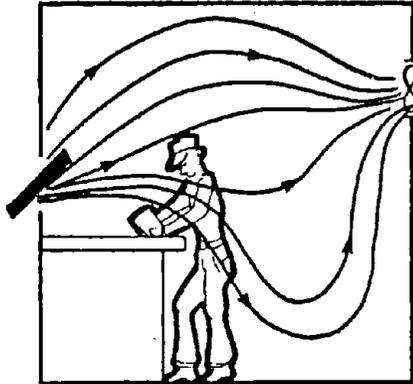
LOCAL EXHAUST VENTILATION

In general, local exhaust systems should be installed wherever a large amount of air contaminant is generated, or where a small amount of an extremely hazardous substance may become airborne. Local exhaust ventilation removes the hazardous substance at or near its point of origin, and prevents it from being drawn through the breathing zone of the worker. Local exhaust ventilation is recommended because it usually performs more efficiently than general dilution ventilation and prevents air contaminants from being circulated throughout the work area.

GENERAL DILUTION VENTILATION

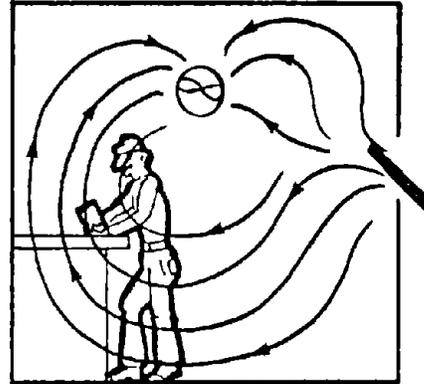
General dilution ventilation systems pull air through the work area to dilute air contaminants to a lower, non-hazardous level. For efficient operation, they require a greater volume of air flow than do local exhaust systems. General dilution ventilation may be an effective control for areas where low concentrations of hazardous substances are generated. It may also be used effectively in some flammable liquid storage

areas or with substances with low hazard potential. The effectiveness of dilution ventilation as a control mechanism depends on air inlet and fan location and their spatial relationship to one another. The figures below illustrate air inlet configurations with good and poor fan locations.



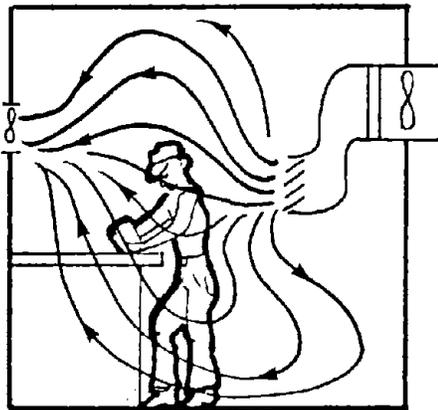
Poor General Ventilation

(Contaminant is driven into the worker's breathing zone and atmosphere)



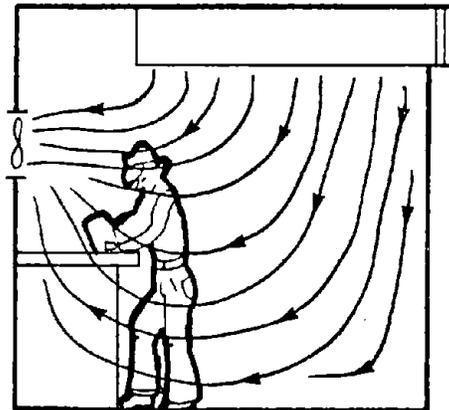
Fair General Ventilation

(Incomplete flushing of the room, contamination of general atmosphere)



Good General Ventilation

(Air enters at breathing zone height and keep contamination away from worker)



Best General Ventilation

(Low velocity diffusion through ceiling, immediate exhaust of contaminated air)

A ventilation hood should be designed to capture the contaminant at the source. There is no "universal" hood. Many hoods in use are the common "Laboratory Style Hood." Slotted-side draft hoods along the back of the bench or slotted-top downdraft ventilation may work well

for open bench tops. Small canopy hoods may cover a piece of equipment to capture the contaminant released by the equipment.

A pressure sensing gauge should be installed where the hood enters the duct work to measure the hood static pressure. The pressure can be monitored daily to assure proper operation of the system. The gauge can be marked to indicate the limit of acceptable operating conditions. Any filter inserted in the exhaust system must be cleaned or changed on a regular basis, particularly if the hood static pressure drops below acceptable levels.

"The Industrial Ventilation Manual, 14th Edition," published by the American Conference of Governmental Industrial Hygienists, provides excellent data for hood design as well as other aspects of ventilation for various operations (e.g., welding, hoppers, and filtering).

The design of a ventilation system is complex. The volume of air which needs to be moved, the velocity required to capture and carry the contaminants, the type of fan which will exhaust the needed air volume, the placement of the exhausts and makeup air inlets, and the overall positioning of the system must all be determined.

A design engineer and an industrial hygiene engineer should be consulted when installing a total environmental control system. Contaminants removed from the breathing zone should be collected by an appropriate air pollution control system before discharge to the atmosphere.

Problems can occur with ventilation systems. Maintenance department personnel, as well as operating personnel, should be aware of these problems:

Design and Installation

- An error may have been made in the design.
- The system may not have been installed according to original design.
- Additional hoods or other exhaust equipment may have been added to the system, reducing the air flow through other hoods.

Hood System

- Adjustable slots may have been altered.
- The hood may have been modified, changing the size of the hood openings.

Duct System

- The duct may have become partially plugged.
- If dampers are used to "balance" the system, the damper settings may have been changed.
- Some ducts contain fused dampers that close in case of a fire. These fuses may melt, causing the damper to close.

- A duct joint may have worked loose or become separated.
- If acids or corrosive or abrasive materials pass through the ducts, the ducts may develop rust holes.

Motors and Fans

- Belts may have become loose or broken.
- Pulley sizes may have been changed.
- Voltage may be low, and fan may be undersized.
- The fan may have been installed backwards.
- The motor may be wired wrong and is rotating backwards. (A centrifugal fan, when running backwards, will not reverse the air flow but will pull a lower volume of air.)
- The fan blades may have become coated with fume or dust particles.
- The wrong type fan may have been selected.

Air Cleaning Devices

- The filters may have become clogged.

Whenever air is exhausted from a room, it has to be replaced by make-up air. If it is not provided, the ventilation system may not operate properly. The area or room should, however, be under a slight negative pressure.

Abrasive Blasting

If your operation includes abrasive blasting (e.g., of battery plates), the following requirements apply:

Blast-cleaning enclosures must have exhaust ventilation. During blasting, a continuous inward flow of air must be maintained at all openings in the enclosure to prevent visible spurts of dust from escaping into adjacent work areas.

Where hard, deep-cutting abrasives are used, observation windows must be made of safety glass protected by screening.

NIOSH-approved respirators or equivalent for abrasive blasting must be worn by all operators when working inside blast-cleaning rooms.

The air for supplied-air abrasive respirators must be free of harmful quantities of dusts, mists, and noxious gases. The air from the regular compressed air line of the plant may be used for the abrasive blasting respirator if the following conditions are met:

- a trap and carbon filter must be installed and regularly maintained to remove oil, water, scale, and odor;
- a pressure reducing diaphragm or valve must be installed to

reduce the pressure down to requirements of the particular type of abrasive blasting respirator;

- an automatic control must be provided to either sound an alarm or shut down the compressor in case of overheating.

Operators must wear heavy canvas or leather gloves and aprons or equivalent as protection from the impact of abrasives.

Safety shoes must be worn where heavy pieces of work are handled to protect against foot injury.

Fire Protection

Everything necessary to start a fire is present in manufacturing plants: **fuel**, such as gasoline, hydrogen generated during battery charging, packing and cleaning materials, paints and solvents, plastics, trash, and many other items; **oxygen** from the air and as liquid oxygen; and **ignition sources**, in the form of flames, sparks, heating systems, welding, hot metal, spontaneous combustion, and electrical equipment. The basic principle of preventing fire in your plant is to keep these three elements separated.

Periodic inspections and proper maintenance of the facility including electrical equipment such as industrial ventilation systems; proper storage and regular disposal of combustible sweeping and cleaning compounds (e.g., oil-treated sawdust), floor coatings containing low flash-point solvents, oily mops and rags, and rubbish; and good house-keeping are the best safeguards against fire. However, even a properly maintained facility can have a fire.

Of primary concern in the event of a fire is the safe evacuation of plant personnel. Regardless of size, each plant should be equipped with a fire alarm system and have an emergency evacuation plan.

FIRE ALARM SYSTEM

The fire alarm system must be under the supervision of a qualified individual. The system must be inspected and tested on a weekly basis. Generally, the fire alarm system includes three "subsystems":

Detection System

The fire alarm system must include detection devices, each designed for the area it is to protect. Typical detection devices are smoke detectors, flame detectors, and heat detectors. Decision regarding the type of

detector(s) to use should be made in consultation with the local fire department.

Extinguishing System

The extinguishing system, activated by the detection system, can be a water system (e.g., automatic sprinkler system), a gas system (e.g., carbon dioxide), or powder system (e.g., sodium bicarbonate). The type of system to use may vary from one plant area to another, depending on the type of fire likely to break out. Consultation with a fire control specialist as well as the local fire department is advised.

Warning System

The warning system should include warning bells or buzzers, flashing lights in noisy areas, and wall-mounted fire alarm activators located at strategic locations throughout the facility. The warning system should be connected into the local fire department.

EMERGENCY PROCEDURES

Regardless of any arrangements made with the local fire department, in case of fire, make sure the fire department is notified before any attempt is made to fight the fire.

While the fire department is being notified, an orderly evacuation from the facility should begin.

Building Evacuation

A plan for orderly evacuation should include the following:

- An evacuation signal, audio, visual, or both.
- A well-planned evacuation route for employees in *all* areas of the facility.
- Designation of a re-assembly area for personnel well away from the plant.
- An accounting procedure for personnel after re-assembly. A daily list of plant personnel on travel or absent should be maintained to facilitate accounting.
- A provision for searching the building for completeness of evacuation. A floor or area "warden" should be designated so as to cover all plant areas.

Notification and Training

A list of telephone numbers of local fire departments should be posted in prominent places throughout the plant—and all employees advised of this posting.

Floor plans for designated plant areas should be posted and explained showing locations of fire alarm activators, fire extinguishers, and exits.

Several employees in each area of the facility should be trained in the use of fire extinguishers.

Occupational Noise Exposure

Sources of noise in the textile machinery manufacturing industry include:

- Metal impacts in metal stamping and sheet metal work.
- Saws and other woodworking machines used in the production of bobbins, loom shuttles, and textile aprons.
- Shakeout, core knockout, tumbling, chipping, and handling operations in foundries.
- Exhaust from machines and tools using compressed air.
- Riveting in the manufacturing of textile aprons.
- Abrasive metal finishing operations such as use of grinders, tumble barrels, blasting equipment, and vibratory bowls.

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

The current standard is 90 decibels, A-weighted (dBA), for an 8-hour exposure. Even at this noise level, hearing damage can be expected in some individuals. As the noise level is increased, the permissible exposure time decreases (e.g., if the level is 100 dBA, the permissible exposure time is 2 hours). The table in this section estimates noise levels and the maximum exposure times allowed.

A noise survey by trained personnel should be made. If an employee's noise exposure is in excess of the standard, a hearing conservation program is required. Such a program would include periodic noise measurement, engineering and administrative controls, hearing protection, and audiometric testing.

The goal of the hearing conservation program should be to develop engineering controls to reduce noise exposure. Engineering controls could include enclosing the noisy equipment, acoustical treatment of walls to reduce noise reflection, vibration damping of noisy machines,

and replacing metal-to-metal contact with synthetic material-to-metal contact. Some specific suggested engineering control methods are listed below:

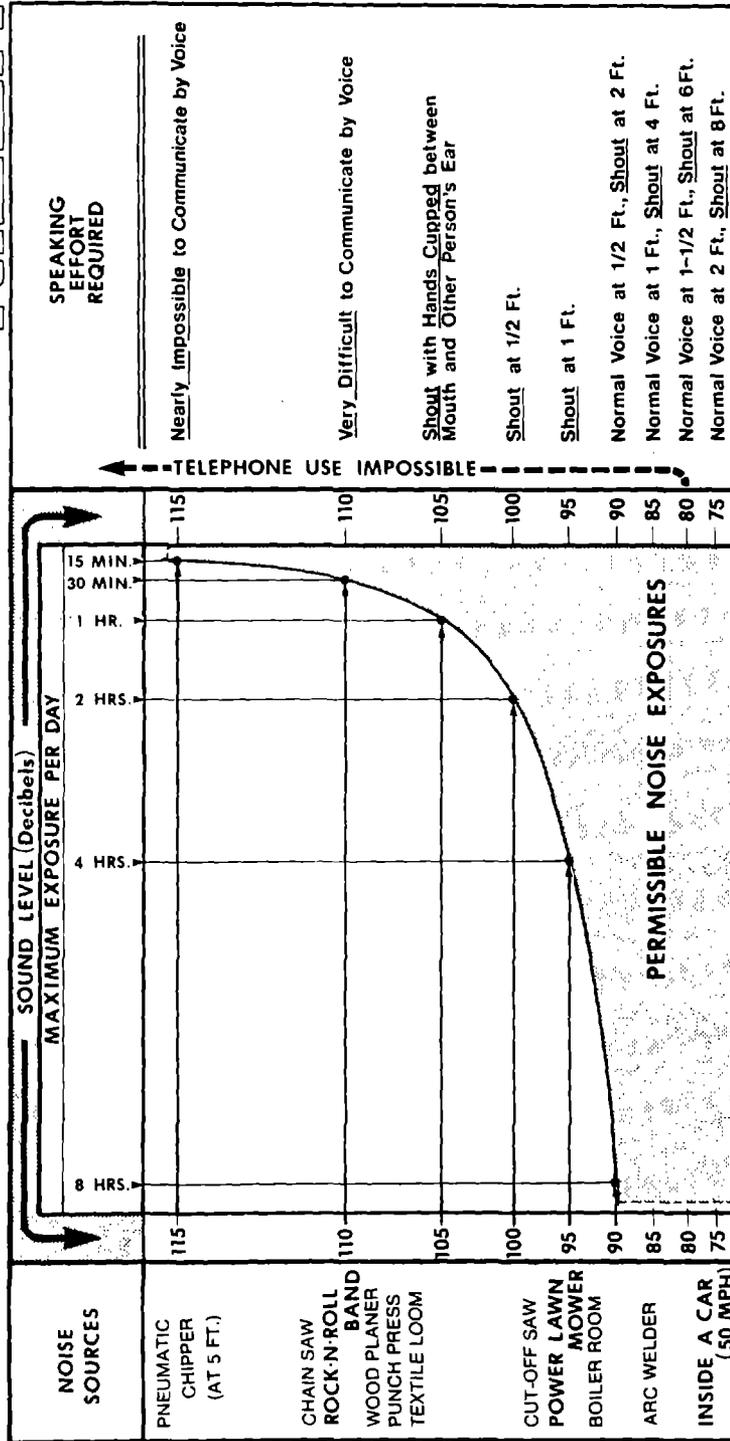
- I. **SUBSTITUTION OF MACHINES**
Larger, slower machines for smaller, faster ones.
Belt drives for gears.
- II. **SUBSTITUTION OF PROCESSES**
- III. **VIBRATION DAMPENING**
Increase mass.
Increase stiffness.
Use rubber or plastic bumpers or cushions.
Change size to change resonance frequency.
- IV. **REDUCING SOUND TRANSMISSION THROUGH SOLIDS**
Flexible mountings.
Flexible sections in pipe runs.
Flexible shaft couplings.
Fabric sections in ducts.
Resilient flooring.
- V. **REDUCING SOUND PRODUCED BY FLUID FLOW**
Intake and exhaust mufflers.
Fan blades designed to reduce turbulence.
Large, low speed fans for smaller, high speed fans.
- VI. **INCLUDING NOISE LEVEL SPECIFICATIONS WHEN ORDERING NEW EQUIPMENT**
- VII. **ISOLATING NOISE SOURCES**
Completely enclose individual machines.
Use baffles.
Confine high noise machines to insulated room.

Administrative controls designed to limit the exposure time to excessive noise can also be used. However, complications may arise when a worker must be shifted to a job which has a different pay scale or classification.

If engineering controls or administrative controls do not prove feasible, or while these controls are being implemented, hearing protection is required. There are many forms of ear protection, such as ear muffs or ear plugs. Some are more effective than others, depending on the noise level, the frequency of the noise, and how well they fit the individual. It is necessary to provide protection that is effective and yet reasonably comfortable to the wearer.

It may soon be a requirement - and it is considered good practice - to have hearing checked by audiometric testing every year for all employees exposed to 85 - 90 dBA noise levels for 8 hours daily.

PERMISSIBLE NOISE EXPOSURES



SPEAKING EFFORT REQUIRED

Nearly Impossible to Communicate by Voice

Very Difficult to Communicate by Voice

Shout with Hands Cupped between Mouth and Other Person's Ear

Shout at 1/2 Ft.

Shout at 1 Ft.

Normal Voice at 1/2 Ft., Shout at 2 Ft.

Normal Voice at 1 Ft., Shout at 4 Ft.

Normal Voice at 1-1/2 Ft., Shout at 6 Ft.

Normal Voice at 2 Ft., Shout at 8 Ft.

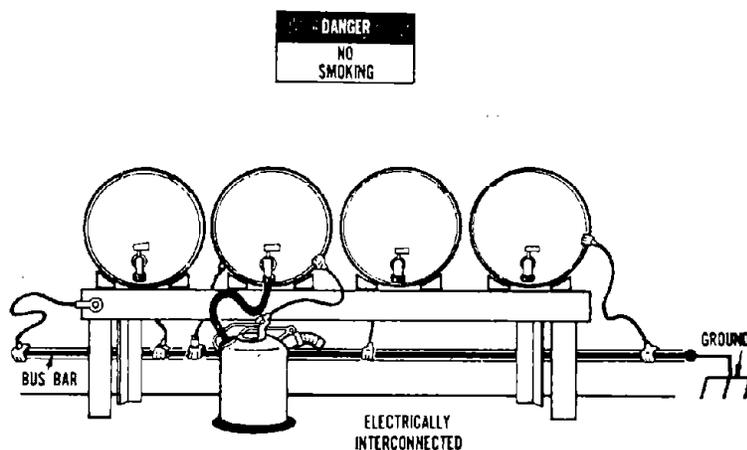
--- TELEPHONE USE IMPOSSIBLE ---

Hazardous Materials

Flammable And Combustible Liquids

Flammable and combustible liquids are identified by how easily they ignite (the flash point). Flammable liquids ignite more readily than combustible ones. Examples of flammables are gasoline, acetone, and lacquer thinner; examples of combustibles are kerosene, fuel oil, and Stoddard solvent.

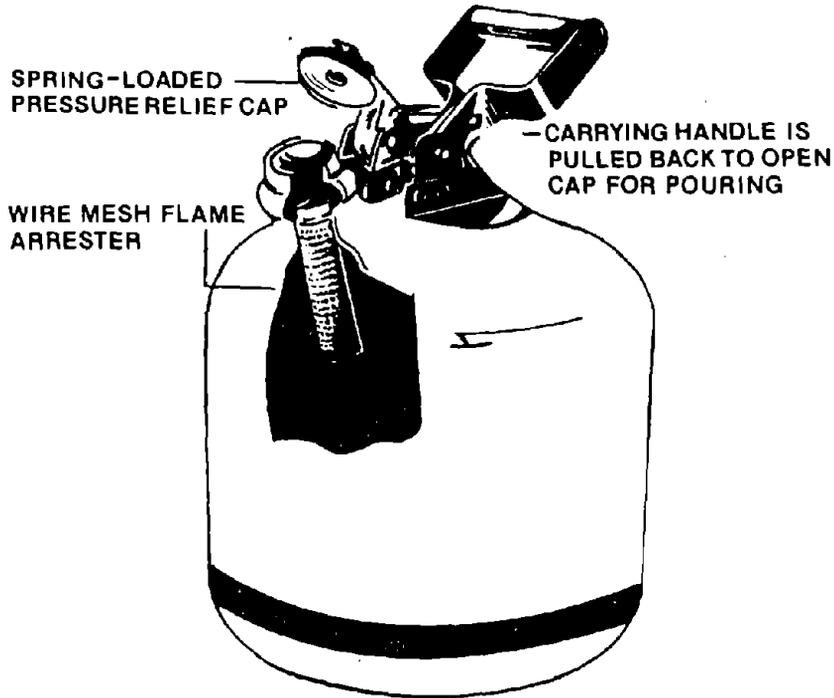
Connections on all drums and piped systems of flammable and combustible liquids must be vapor and liquid tight.



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

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



An approved safety container

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

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.

Storage Cabinets

Storage cabinets must be distinctly labeled "FLAMMABLE — KEEP FIRE AWAY."

Metal cabinets must be constructed of at least no. 18 gauge sheet iron, double-walled with a 1 1/2-inch air space and tight 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 rabbeted and fastened in two directions with flathead wood screws.

Inside Storage Areas

Each inside storage area must be prominently posted as a "NO SMOKING" area. Openings to other rooms or buildings must be provided with noncombustible, liquid-tight raised sills or ramps at least 4 inches in height. An open-grated trench inside the room which drains to a safe location is a permissible alternative to a sill or ramp. General exhaust ventilation (either gravity or mechanical) which provides for a complete change of air within a room at least six times each hour is required. All lights, electrical equipment, and wiring must be of the type approved for hazardous locations.

A fire extinguisher must be available (12 B minimum) located within 10 feet of the door.

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 fire extinguisher available at the storage area.

LPG Storage Areas

LPG storage tanks must be guarded to protect them from vehicular damage. The tank area must be posted "NO SMOKING" and there must be a fire extinguisher available in the area. Engines on vehicles must be shut down while being fueled.



Emergency Procedure for Leakage or Spills of Toxic Materials

In the event of a spill or leakage of a hazardous material, the first concern is the evacuation of the area. After this, clean-up of the spill should begin. So that the employer and employees are prepared for these situations, an emergency procedure should be developed.

The emergency procedure for leakage or spills of hazardous materials should include the following:

- Designation of one or more persons to take charge, should a spill or leak occur. This person should have knowledge of the chemicals and materials in his area, including toxicity, fire hazard potential, special handling procedures, and special emergency procedures. This information often can be obtained from Material Safety Data Sheets (MSDS) or from published data on the hazardous agents. A file of MSDS should be kept which is accessible by other plant personnel.
- Identification of the areas where a leak or spill of a hazardous substance could occur. Employees who could be affected should also be identified.
- A telephone number to call to obtain emergency information about the various hazardous agents.
- Identification of the nearest exit from potential spill areas.
- A detailed plan of action in the event of a spill or leak.
- A brief description of the method for containment and clean-up of hazardous materials. (The person in charge should have a detailed method for containment and clean-up.)
- A procedure for re-entry into the affected area.

Exhibit I illustrates an emergency procedure for the spill or leakage of sulfuric acid.

You will have to decide what constitutes an "emergency" in your plant, what a "spill" is (what quantity), and what a "leak" is. All affected employees should be briefed on the emergency procedure(s) before posting.

Acme Company
Parts Division
Dept: ELECTROPLATING

EMERGENCY PROCEDURE
SPILL OR LEAKAGE OF SULFURIC ACID

- I. Individual in Charge: R.L. Jones, Leadman
Office : Bldg. 4, Aisle 3, SW Corner
Telephone Number : x 2785
- II. Material Safety Data Sheet: Number 688
- III. Identified Areas of Usage: Storage Room
: Electroplating Dept.,
Tank 14
: Research Laboratory
Employee Groups Affected: Materials Handler
Rackers
Chemists
- IV. Emergency Telephone Number: 1-800-325-7845
(ACME Company)
- V. Nearest Exit (for this Dept.): NE Corner-
Electroplating
Dept.
- VI. Plan of Action
 - A. Leave area through designated exit.
 - B. Contact individual in charge.
 - C. Await further instructions from Dept. head.
- VII. Containment and Clean-Up Method - General
 - A. Put on designated personal protective equipment.
 - B. Contain spill by setting sandbags around spill.
 - C. Apply "ACID-DRY" absorbing material.
 - D. After absorption, place used absorbent in NEOPRENE RUBBER bag. Consult File 688 for more detailed instructions.
 - E. Dispose bag in container marked acid waste located under canopy adjacent to No. 3 storage room.
- VIII. Re-entry Into Work Area

Return to work instructions will be given by Dept. head over loudspeaker.

Spray Painting

General Requirements

Portable lamps must be removed during spraying.

Low flash-point thinners (less than 100°F) may be used for cleaning purposes only if used in a well-ventilated area such as a spray booth.

The fire control sprinkler heads must be kept clean and free of paint build-up.

"NO SMOKING" signs must be posted wherever flammable liquids are sprayed or stored.

Parts to be painted should be arranged so that overspray and fumes are not drawn through the employee's breathing zone by the ventilation system.

Protective clothing such as gloves, apron, and a cloth cap should be worn.

Respirators must be cleaned and maintained regularly.

There should never be more than one day's supply of paint outside of storage rooms or cabinets.

Spray Areas

The spray area must be at least 20 feet from flames, sparks, electric motors which are not explosion proof, or other ignition sources.

The spray area must be free from hot surfaces, such as heat lamps.

Electric lights in the spray area must be covered and guarded from accidental breakage.

The spray area must be kept clean of combustible residue.

Mechanical ventilation must be provided and kept operating to remove vapors during the painting.

Spray Booths

Spray booths must be made of metal, masonry, or other suitable non-combustible material and be smooth on the inside to aid in cleaning.

Floors and baffles must be noncombustible and easily cleaned.

Spray booth lights must be explosion-proof or enclosed in sealed panels.

Mechanical ventilation must be installed and operating during spraying.

The ventilation rate must be at least 100 linear feet per minute over the open face of the booth.

Electric motors for the exhaust fans must be outside the booth or ducts and the belts and pulleys fully enclosed.

Air exhausted from the paint booth must be discharged outside where it cannot re-enter the building.

Ducts connected to the booth must have access doors to allow for cleaning.

Air supply must be maintained for paint booths.

Plugged overspray filters must be replaced.

When temperatures are below 55°, the make-up air must be heated to at least 65° except where adequate and safe means of radiant or general building heating maintains a minimum temperature of 65° with the exhaust system in operation.

The heater for the make-up must be located outside the spray booth.

Paint Drying Apparatus

Mechanical ventilation must be left on while the paint is drying. A warning sign to this effect must be attached to the drying apparatus.

The area used for drying with portable heaters or lights must be kept clean of overspray products.

Drying equipment must be kept out of the spray area during spraying operations.

All electrical drying apparatus must be properly grounded.

Personal Protective Equipment

General Requirements

Personal protective equipment is required whenever there are hazards that can do bodily harm through absorption, inhalation, or physical contact. This equipment includes protective devices for the eyes, face, head, and extremities, protective clothing, and respiratory protection.

All personal protective equipment must be of safe design and reliable condition.

Eye And Face Protection

Eye protection and/or face shields are required where there is a possibility of any injury from flying particles, chips, sparks, and splashes from liquids such as caustics, solvents, and hot or molten metals. Employees must wear this equipment when they use grinders, power drills, or other equipment which produces dust and chips.

Eye and face shields must be designed to provide adequate protection against the particular hazards to which the employee is exposed. The equipment must be easy to clean and be capable of being disinfected. If goggles must be worn by employees who wear glasses, either the goggles must fit over the glasses, or the corrective lenses can be mounted behind the protective lenses.

Gloves

When handling hazardous liquids, resins, acids, or other hazardous materials, employees must wear gloves which are impervious to such

materials. Gloves and arm protectors should be used to prevent lacerations from handling sheet metal. Gloves are also advisable for wood-working operations where wood handling may result in lacerations and splinters. The gloves must be long enough to protect the forearms. Gloves should be inspected periodically for pinholes and material integrity. If glove liners are used, they should be changed at least as often as the gloves. A decision regarding the use of a glove type for specific applications should be made in consultation with the supplier. The following table suggests glove types for exposure to the listed substances:

CHEMICAL	NATURAL RUBBER OR		POLY- VINYL ALCOHOL	BUNA-N	POLY- ETHYLENE	VINYL
	NEOPRENE	LATEX				
Acetone	G	E	E	E	G	F
Amine hardeners	F	F	E	G	G	F
Chlorine	G	F	E	G	C	F
Chromic acid	F	P	P	F	G	G
Degreasing fluids	F	P	E	G	E	P
Epoxy resins, dry	E	E	E	E	E	E
Hydraulic oil:						
Petroleum base	G	P	E	E	E	F
Ester base	E	P	G	G	G	P
Inorganic salts	E	E	F	E	E	C
Isopropyl alcohol	E	E	F	E	E	G
Ketones	G	E	G	G	G	F
Lacquer thinners	G	F	E	G	F	F
Mercury	G	G	P	P	E	P
Nitric acid	G	F	NR	F	F	F
Paint thinners	G	F	E	G	C	F
Petroleum spirits	E	F	E	E	G	P
Phosphoric acid	E	G	P	E	E	G
Plating Solutions	E	E	F	E	E	E
Stearic acid	E	E	E	E	E	C
Potassium hydroxide	E	E	P	E	E	G
Sodium hydroxide	E	E	P	E	E	G
Stoddard solvent	E	F	E	E	G	F
Sulfuric acid	G	G	P	G	F	F
Toluene	F	P	E	E	G	P
Trichloroethylene	F	P	E	F	G	P
Xylene	P	P	E	E	G	P

KEY: E = excellent; G = good; F = fair; P = poor; NR = not recommended

Head Protection

Protective head covering (hard hat) is required in situations where workers may be struck in the head by falling or flying objects.

Foot Protection

Safety shoes are recommended to prevent injury to the feet from falling objects and other hazards. They should be worn particularly where heavy stock is handled. They should also be worn where there are parts-handling, shipping, and receiving operations. In areas which may be slippery (e.g., battery charging and acids areas), appropriate footwear, such as rubber boots, which provides good traction shall be provided. When workers handle hazardous liquids, footwear must be impervious to such liquids.

Aprons

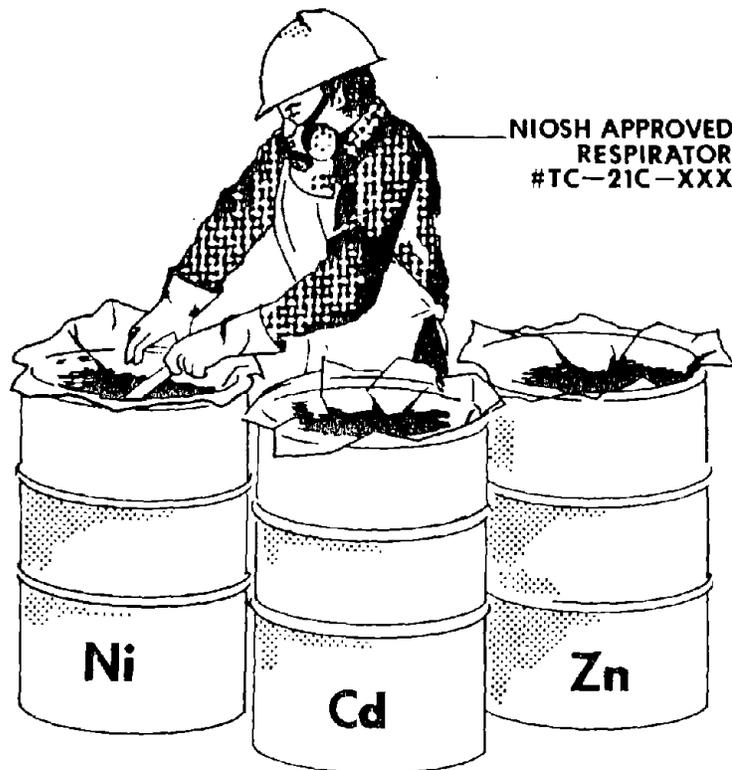
When aprons are used as protection from acids and other hazardous materials, the apron must be impervious to such materials.

Coveralls, Caps, Etc.

Under special conditions (e.g., dusty operations) a complete change of outer clothes may be necessary at the end of a shift. Coveralls, caps, and other types of clothing (rubber suits, etc.) should be worn while working. This clothing should be discarded at the end of the shift in appropriate hampers and the employee should change to street clothes (after a shower, if necessary). It may also be necessary to have a separate laundry facility or have the clothing sent to a commercial laundry.

Respiratory Protection

NIOSH-approved respirators or equivalent must be provided by the employer when air is contaminated with harmful dusts, fumes, mists, gases, or vapors. Respiratory protection is not to be used as a substitute for feasible engineering or administrative control. If these methods are not feasible, or while these controls are being implemented, use of respirators is permitted.



When respirators are used, a respirator program must be established: Respirators must be selected which are designed to protect against the specific hazards to which the worker is exposed.

Written instructions covering selection and use of respirators must be available.

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

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

Two people should never wear the same respirator unless it has been cleaned and disinfected between use.

All straps should be tied and adjusted.

A good face seal is necessary. Beards, sideburns, and glasses may interfere.

Filters should be replaced when the respirator has been used for the specified lifetime of the cartridge, when an employee can smell vapors in the mask, or when breathing becomes difficult.

General Environmental Controls

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

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

Restrooms must be kept in a clean and sanitary condition.

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

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

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



Beverages or food must not be stored or consumed in a toilet room or in any area exposed to toxic materials.

Note that the regulations on common drinking cups and the ratio of toilets to number of employees were being considered for elimination when this Guide went to press.

Employees working with toxic substances should wash and, where necessary, change from contaminated clothing before eating, drinking, or smoking.

Medical And First Aid

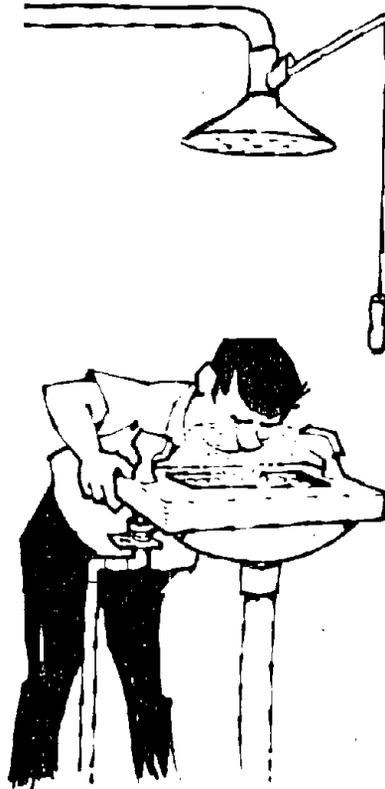
An important part of the company safety and health activity is a medical and first aid program. This program can help prevent lost work time and achieve good morale among employees. Medical personnel must be readily available—by phone or in the plant—for advice and consultation on employee health matters. A good policy is to require a medical examination before hiring and placement to ensure that prospective employees are physically able to do their specific jobs, and to determine if employees have some medical problem which could be aggravated by the assigned work. Periodic health evaluations for hazardous jobs and early treatment of any illness or injury should also be encouraged.

Hospital emergency phone numbers should 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 to transport injured or ill employees to a hospital.

If no infirmary, clinic, or hospital for the treatment of all injured employees is located in near proximity to your plant, the following are required:

- At least one and preferably more employees on each shift must be trained in first aid. The American Red Cross, the Mining Enforcement and Safety Administration, some insurance carriers, local safety councils, and others with OSHA-approved programs provide acceptable training.
- First aid supplies approved by a consulting physician must be readily available. The supplies should be in sanitary containers with individually sealed packages for material such as gauze, bandages, and dressings that must be sterile. Other items often needed are adhesive tape, triangular bandages (to be used as slings), inflatable plastic splints, scissors, and mild soap for cleansing of wounds or cuts.

- Suitable facilities for quickly drenching or flushing the eyes and body must be provided within the work area when a person may be exposed to corrosive material.



Some states have laws concerning medical practice which establish limits on first aid given by the lay person. Trained employees should understand where first aid ends and actual medical treatment begins.

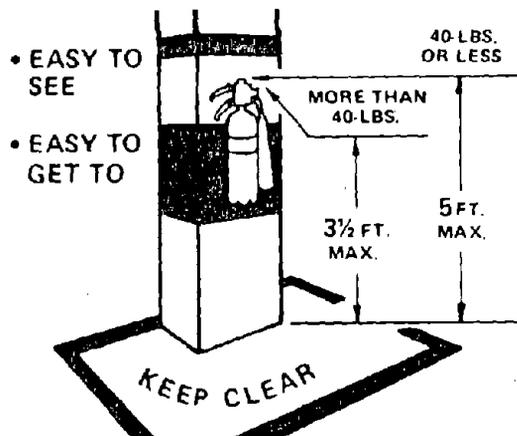
First aid is immediate, temporary treatment given in the event of accident or illness—before the doctor arrives. Immediate first aid (within four minutes) may prevent death or permanent impairment, and may lead to complete recovery.

Fire Protection

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 five feet (to the top of the extinguisher) if 40 pounds or less. If heavier than 40 pounds, they must not be mounted higher than 3 1/2 feet. (OSHA may eliminate this requirement. Contact your OSHA area or regional office for more information.)



- be inspected by management or a qualified designated employee at least monthly to insure that
 - they are in their designated places,
 - they have not been tampered with or actuated, and
 - there is no corrosion or other impairments of the activation mechanism;
- be examined at least yearly and recharged or replaced if necessary, to insure operability and safety. (OSHA may also elimi-

nate this standard.) A tag must be attached to show the maintenance or recharge date and signature or initials of the person performing the service. (The tagging requirement may also be eliminated. Check with your OSHA area or regional office.)

- be hydrostatically tested. Extinguisher sales representatives usually will perform this service at appropriate intervals;
- be selected by a qualified individual(s) on the basis of type of hazard, degree of hazard, and area to be protected. The following table will help in the selection.

Type of hazard	Basic minimum extinguisher rating	Maximum travel distance to extinguishers (feet)
Light	4B	50
Ordinary	8B	50
Extra	12B	50

Basic minimum extinguisher rating for area specified	Maximum travel distance to extinguishers (feet)	Areas to be protected per extinguisher		
		Light hazard occupancy (square feet)	Ordinary hazard occupancy (square feet)	Extra hazard occupancy (square feet)
1A	75	3,000
2A	75	6,000	3,000	Note 1
3A	75	9,000	4,500	3,000
4A	75	11,250	6,000	4,000
6A	75	11,250	9,000	6,000

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

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

Automatic Sprinkler Systems

When automatic sprinkler systems are provided, they must meet design requirements of the National Fire Protection Association's Standard for the Installation of Sprinkler Systems (NFPA No. 13-1969). (OSHA requirements are extracted from the NFPA Standard.)

The following are important provisions of these requirements:

Every automatic sprinkler system must have at least one automatic water supply of adequate pressure, capacity, and reliability.

One or more fire department connections through which the fire department can pump water are required. No shut-off valve is allowed in the connection. (OSHA may eliminate the prohibition on shut-off valves. 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 sprinkler deflectors and the top of combustible storage 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, a minimum clearance of 18 inches is allowed. Also, commodities containing only small amounts of combustible material may be stored up to 18 inches from the sprinkler deflectors.

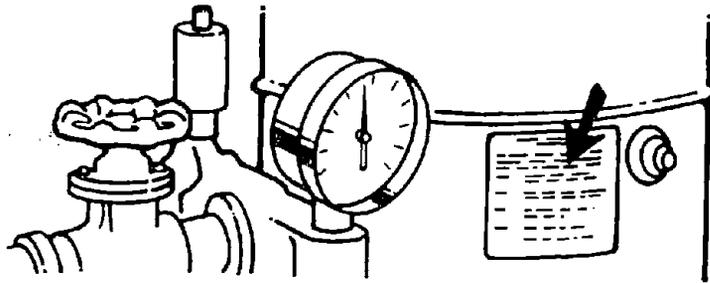
Alarm systems, audible to all employees, should be provided on all automatic sprinkler installations.

An elaboration of requirements pertaining to automatic sprinkler systems can be found in the General Industry Standards, 29 CFR 1910.159.

Compressed Air Equipment

Employees should be familiar with the air compressor's operating and maintenance instructions.

New air tanks must be constructed in accordance with the American Society of Mechanical Engineers (A.S.M.E.) Boiler and Pressure Vessel Code, Section VIII. The A.S.M.E. Code requires this information to be permanently stamped on the air tank.



The drain valve on the air tank should be opened frequently to prevent excessive accumulation of liquid.

Air tanks must be protected by safety-relief valves. These valves must be tested at regular intervals to be sure they are in good operating condition.

The pressure controller and gauge must be maintained in good operating condition.

There must be no shut-off valves between the air tank and the safety valve.

Materials Handling and Storage

Materials Handling—General

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

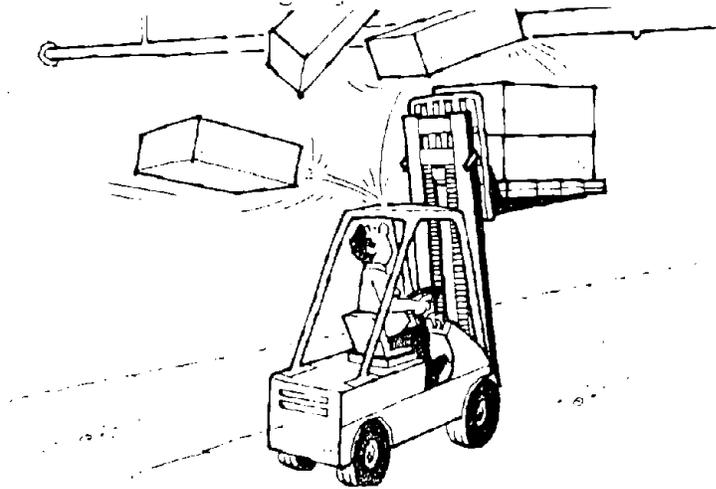
All containers should be kept closed and drums sealed. If any leakage occurs, the damaged container must be removed and any fire or slipping hazard eliminated.

Aisles in the storage area must be kept free of obstructions and sufficient clearance maintained for foot and vehicular traffic. Where limited clearance exists (e.g., low overhead clearance), clearance limit warning signs must be posted. Proper drainage must be provided throughout the storage area. (OSHA is now considering the elimination of this drainage requirement. Your OSHA area or regional office has more detailed information.)

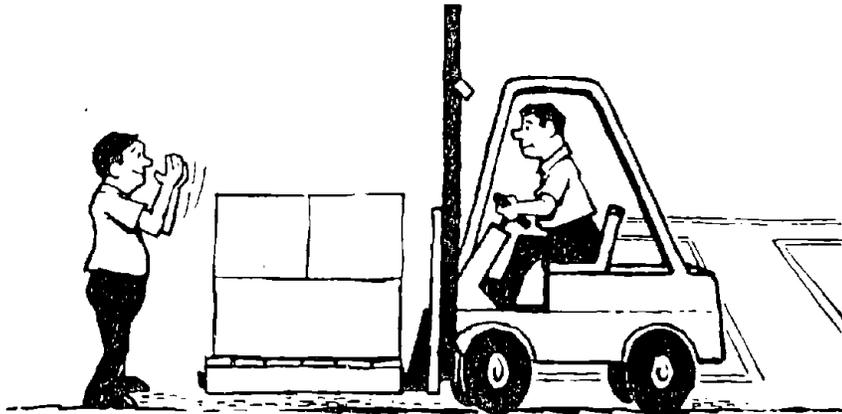
Powered Industrial Trucks

Locations in which powered industrial trucks are used must be classified according to their fire hazard potential (1910.178 (c) (2)). Since the powered industrial truck may provide the spark or hot surface needed to start a fire, the type of truck should be selected with reference to where it is to be used.

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



Operators must be trained in the safe operation of powered industrial trucks, and only trained and authorized employees may operate a truck. Truck manufacturers and suppliers may provide training courses.



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

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

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



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

If battery-operated equipment is used, the battery charging area is to be designated with a "NO SMOKING" sign because of the hydrogen gas emitted during the charging process.

Cranes

Although the information provided in this section pertains specifically to cranes, these requirements should be applied to all hoisting equipment.

All new cranes constructed and installed or utilized on or after August 31, 1971, must meet the design specifications of the American National Standard Safety Code for Cranes (see references in "INFORMATION SOURCES"). Cranes constructed prior to that date should be modified to conform to these design specifications, unless it can be shown that the crane cannot feasibly or economically be altered and that the crane substantially complies with the requirements.

Other OSHA requirements include:

Only personnel designated as qualified by the employer shall be permitted to operate cranes.

The rated load of the crane must be plainly marked on each side of the crane, and be clearly legible to the operator.

Employees should be made aware of the weight of the load.

Hooks, ropes, chains, brakes, and all functional operating mechanisms must be inspected daily for indications of damage and excessive wear.

Written and signed inspection reports must be made monthly on critical items such as brakes, hooks, and ropes and be readily available.

Hand signals to operators should be those prescribed by the applicable ANSI standard for the type of crane in use.

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

Hoisting, lowering, swinging, or traveling is not permitted while anyone is on the load or hook.

Loads must not be carried over the heads of people.

The operator must test the brakes each time a near capacity load is handled, by raising it a few inches and applying the brakes.

The operator must not leave his position at the controls while the load is suspended.

All cranes using a lifting magnet must have a switch in the magnet circuit with provisions for locking the switch in the open position.

When the hook is in the extreme low position, at least two complete wraps of rope must remain on the drum. Rope ends must be safely and securely attached to the drum by means of a clamp or socket arrangement approved by the crane or rope manufacturer.

When making a hook up, the hook must be centered over the load to prevent swinging.

The trip setting of hoist limit switches must be determined by tests with an empty hook.

Overhead and Gantry Cranes

OSHA requirements include:

Access to the cab and/or bridge walkway must be by a conveniently placed fixed ladder, stairway, or platform requiring stepping over no gap exceeding 12 inches.

Exposed moving parts such as gears, set screws, projecting keys, chains, chain sprockets, and reciprocating components which might constitute a hazard under normal operating conditions must be guarded.

If an electrical service receptacle is provided in the cab or on the bridge of cab-operated cranes, it must be a grounded three-prong type permanent receptacle.

A carbon dioxide, dry-chemical, or equivalent hand fire extinguisher should be kept in the cab.

Each independent hoisting unit must be equipped with at least one self-setting holding brake applied directly to the motor shaft or some part of the gear train which is applied automatically when power is removed.

Slings

Each day before use, the sling and all fastenings and attachments must be inspected by a competent 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 kept. Each new, repaired, or reconditioned alloy steel chain sling must be proof tested before 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 their loads and must not be loaded in excess of their rated capacities.

Slings must be padded or protected from the sharp edges of their loads.

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

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

The most common methods of machine guarding are

- enclosing the operation (the preferred method)
- interlocking devices
- two-hand tripping devices
- electronic safety devices

ENCLOSURE GUARDS

Fixed enclosure guards are preferred to all other types. They always prevent access to dangerous parts by completely enclosing a hazardous operation, and can also be effective in controlling dust or chips generated by the operation. Because of limited feed-size openings, enclosure guards admit stock, but will not admit an employee's hand into the danger zone. They may be constructed so as to be adjustable to different sets of tools and dies or varying thicknesses of stock, but once adjusted, they must be fixed. As a general rule, power transmission apparatus can be protected by enclosure guards.

INTERLOCKING GUARDS

When a fixed enclosure guard is not practicable, an interlocking enclosure or barrier should be considered as the first alternative.

An interlocking enclosure guard is not fixed; it may be opened to feed stock and adjusted as the operation requires. These guards use an electrical or mechanical interlock with the operating mechanism which prevents the operation of the machine until the guard is returned to a closed position and the operator can no longer reach the point of danger.

TWO-HANDED OPERATING DEVICES

Two-handed operating devices, another category of guarding mechanism, are also designed to protect a machine operator from point of operation hazards. Although they are not guards in the technical sense, they accomplish the same effect.

These devices may be used to activate the machine cycle. They require simultaneous action of the operator's hands on electrical switch buttons, air control valves, mechanical levers, etc. The actuating controls must be located so as to make it impossible for the operator to move his hands from the controls to the danger zone before the machine has completed its closing cycle. The two-handed controls must be so designed as to prevent the blocking, tying down, or holding down of one control to allow one hand free access to the danger zone.

AUTOMATIC GUARDS

When neither an enclosure guard nor an interlocking guard is practicable, an automatic guard may be used. An automatic guard acts independently of the operator, repeating its cycle as long as the machine operates. This type of guard removes the operator's hands, arms, or body from the danger zone as the machine cycles. It is operated by the machine itself through a system of linkages connected to the operating mechanism.

Common types of automatic guards are sweep and push-away devices which create a moving barrier across the danger zone and push the operator's hands away from the area.

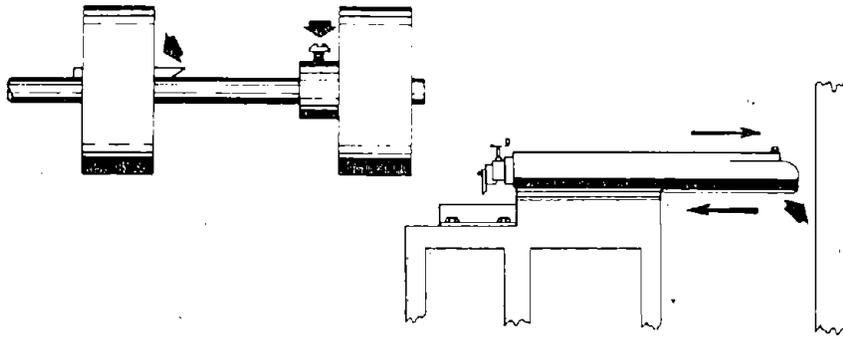
Certain guarding methods are preferable to others. The type of operation, the size and shape of stock, the method of handling stock, the physical layout, the type of material, and the production requirements

or limitations are important considerations. A certain flexibility in operations may also determine the method to be used.

A booklet entitled "Essentials of Machine Guarding," OSHA 2227, can be obtained by writing to OSHA Regional Offices listed in the back of this book. Many equipment representatives can assist in obtaining the necessary protective devices.

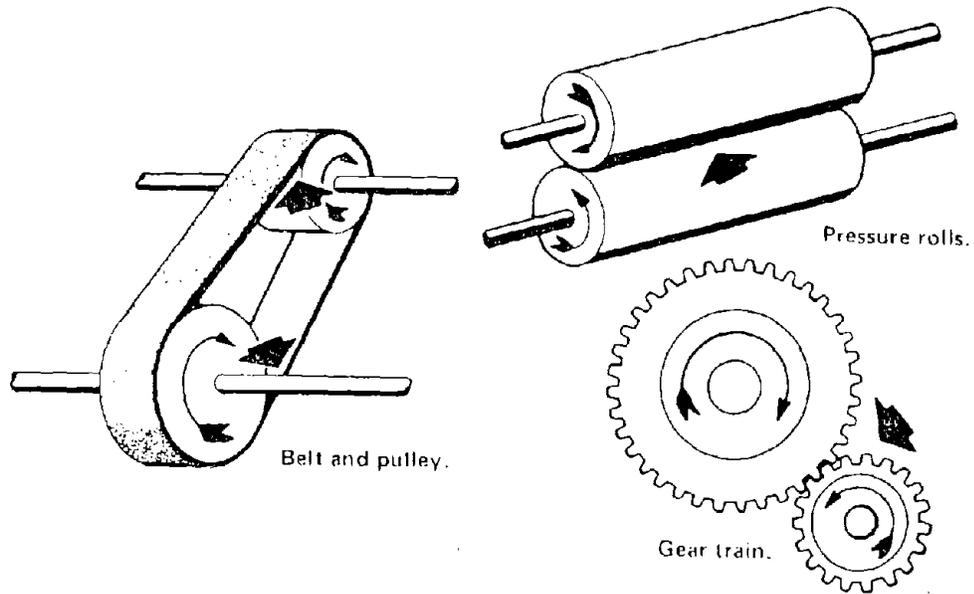
Some typical machining and process actions that will require appropriate guarding are:

ROTATING AND RECIPROCATING MOTION



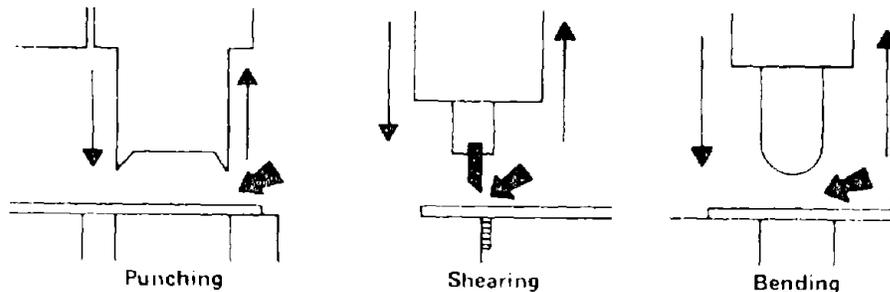
Collars, couplings, cams, clutches, flywheels, shaft ends, spindles, lead screws, and horizontal or vertical shafting are typical examples of rotating mechanisms which are hazardous. The danger increases when bolts, oil cups, nicks, abrasions, and projecting keys or screw threads are exposed when rotating.

IN-RUNNING NIP POINTS



In-running nip points are a special danger created by the action of rotating objects. Whenever machine parts rotate toward each other or where one rotates toward a stationary object, an in-running nip point is formed. Objects or parts of the body may be drawn into this nip point and be bruised or crushed. Gears, feed rolls, conveyor terminals, forming rolls, and printing press rolls are examples of nip points.

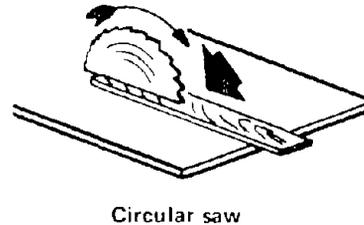
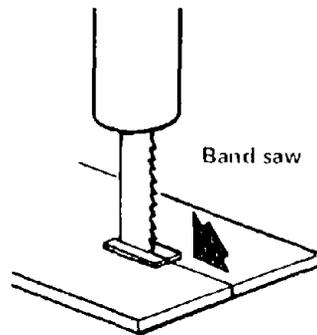
PUNCHING, SHEARING, AND BENDING ACTION



Punching, shearing, or bending action results when power is applied to a ram (plunger) or knife for the purpose of blanking, trimming, drawing, punching, shearing, or stamping material as differentiated from removing the material in the form of chips. The danger of punching, shearing, or bending action lies at the point of operation where stock is actually inserted, held, and withdrawn.

Typical examples of equipment involving punching, shearing, or bending action include power presses, shears, embossing presses, and stamping presses.

CUTTING ACTIONS



Cutting action results when rotating, reciprocating, or transverse motion is imparted to a tool so that the material removed is in the form of chips. The danger of cutting action exists at the movable cutting edge of the machine as it approaches or comes in contact with the material being cut. Such action takes place at the point of operation in cutting wood, metal, or other materials, as differentiated from punching, shearing, or bending by press action.

Typical examples of cutting action are band and circular saws, milling machines, planing or shaping machines, turning machines, boring or drilling machines, and grinding machines.

The following pages contain examples of guarding machinery and processes which are found in the manufacture of textile machinery. 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.

Woodworking Equipment

General Guarding Requirements

"STOP" SWITCH. Every machine must have a "stop" switch within easy reach of the operator. Machines requiring more than one operator must have "stop" switches handy to each operator.

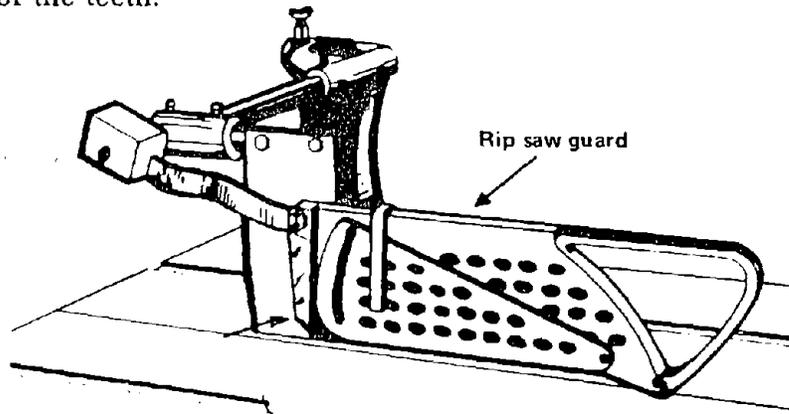
MASTER SWITCH. Every machine must be provided with a means of keeping the machine inoperative while repairs or adjustments are being made. A disconnect switch that can be locked in the "off" position is recommended.

SCRAP AND WASTE. The working surface of machinery must be kept clear of scrap material to prevent possible serious injuries should scrap come in contact with saw or cutter blades.

Specific Guarding Requirements

RIP SAWS

Rip saws must have a hood that covers the saw at all times, to the depth of the teeth.



The hood must adjust itself automatically to the thickness of, and remain in contact with, the material being cut.

A spreader and non-kickback device must be provided.

The exposed part of the saw underneath the table must be guarded.

TABLE SAWS

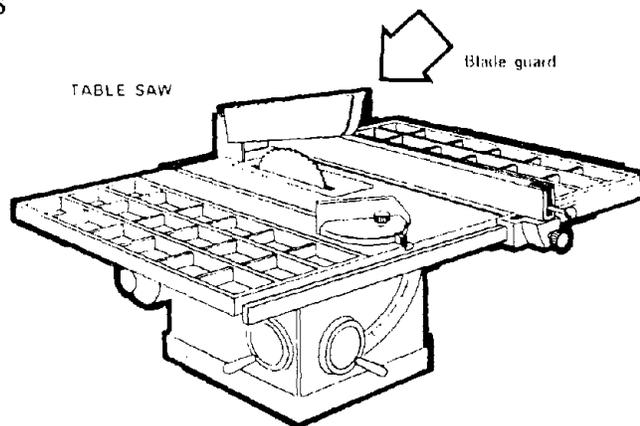


Table saws must be provided with a hood that covers the saw at all times.

The standard hood guard may be impractical when rabbeting and dadoing. In this case, an effective guarding procedure can be managed by the use of a jig to hold the work, thereby keeping the hands away from the blade.

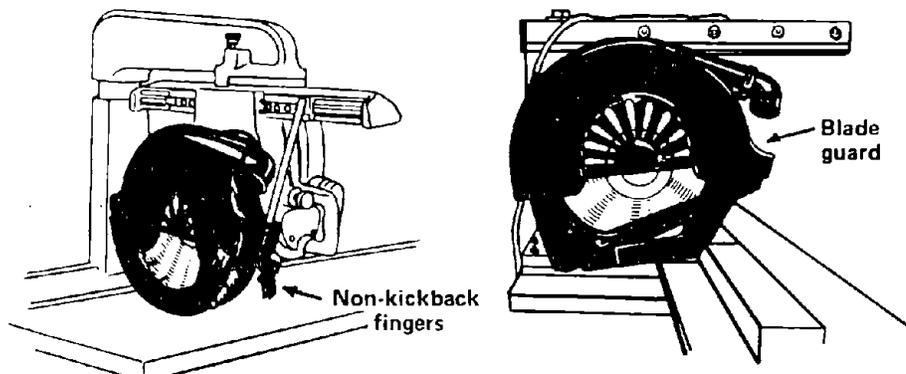
Table saws do not have to be equipped with a spreader or non-kickback device, unless used as a rip saw.

The exposed part of the saw underneath the table must be guarded.

RADIAL SAWS

Radial saws must be provided with:

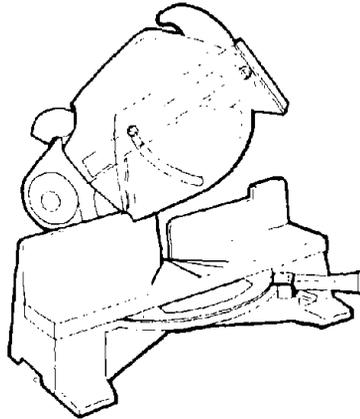
- An upper hood to enclose the top portion of the blade down to a point that will include the end of the saw arbor. The sides of the lower exposed portion of the blade must be guarded to the full diameter of the blade by a device that automatically adjusts to the thickness of the stock being cut.



- 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 to limit forward travel of the blade beyond distance necessary to complete cut in repetitive operations.
- A head which automatically returns to starting position.
- Marking on hood showing the direction of saw rotation. In addition, a permanent label must be affixed to the rear of the guard reading: "DANGER, DO NOT RIP OR PLOW FROM THIS END."

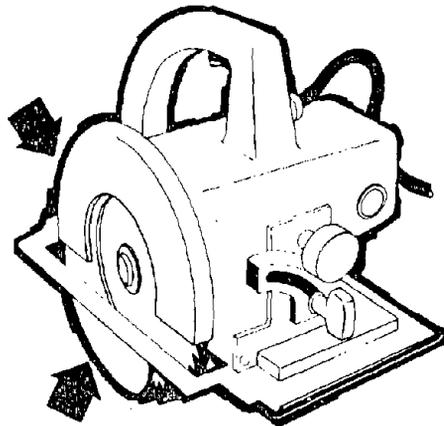
MITER SAWS

The hood must enclose the upper part of the blade.
The lower part of the blade must be adequately guarded.



PORTABLE CIRCULAR SAWS

The blade must be guarded above and below the base plate or shoe.



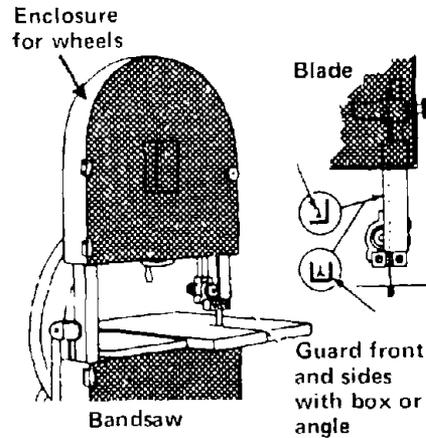
When the saw is withdrawn from the work, the lower guard must automatically and instantly return to covered position.

The saw must be equipped with a dead-man switch.

BANDSAWS AND BAND RESAWS

Bandsaws and band resaws must be provided with:

- An enclosure for the entire blade except for the working portion of blade.

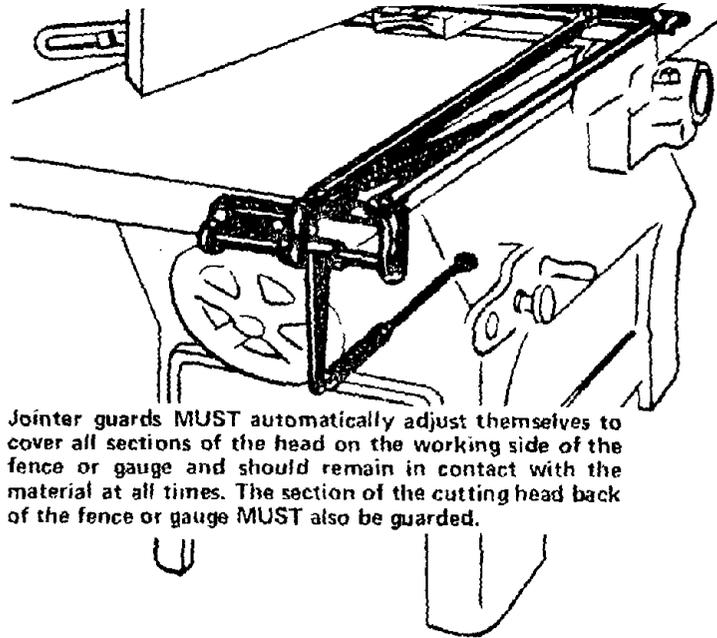


- An enclosure for wheels.
- A tension control device.
- A suitable guard on in-running feed rolls.

JOINTERS

Requirements for jointers include:

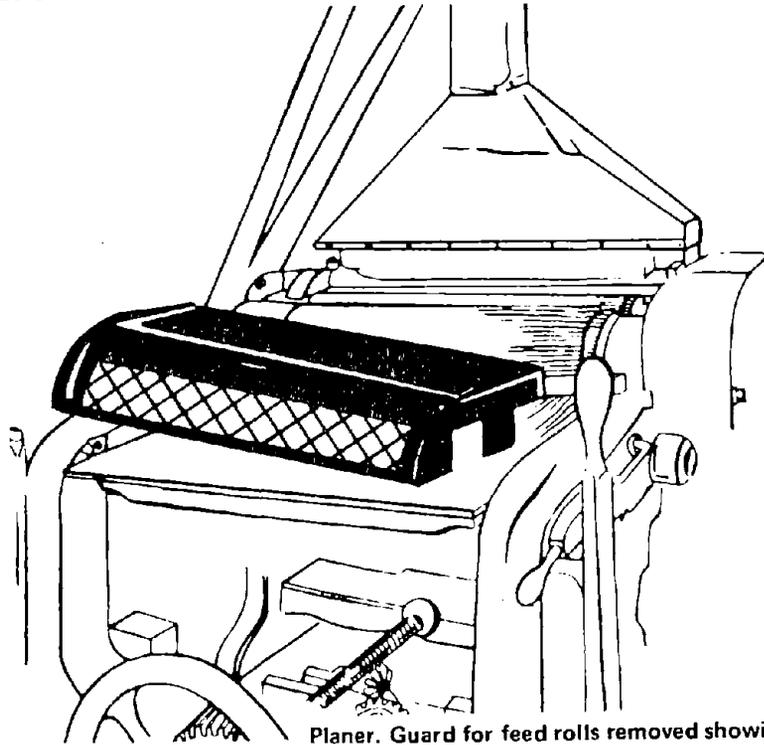
- Hand-fed with horizontal head: a cylindrical cutting head with knife projecting no more than 1/8 inch beyond cylinder.
- Table openings: clearance between rear table and cutter head—1/8 inch maximum. Table throat opening (when tables are set with each other for zero cut) 2-1/2 inches maximum.



Jointer guards **MUST** automatically adjust themselves to cover all sections of the head on the working side of the fence or gauge and should remain in contact with the material at all times. The section of the cutting head back of the fence or gauge **MUST** also be guarded.

- Horizontal head: an automatic guard covering the head on the working side of the fence or gauge, and a guard covering the head back of the fence or gauge.
- Vertical head: an exhaust hood or other guard completely enclosing the revolving head, except for a slot wide enough to perform the work.

PLANERS



Planer. Guard for feed rolls removed showing substantial construction.

DISC SANDERS

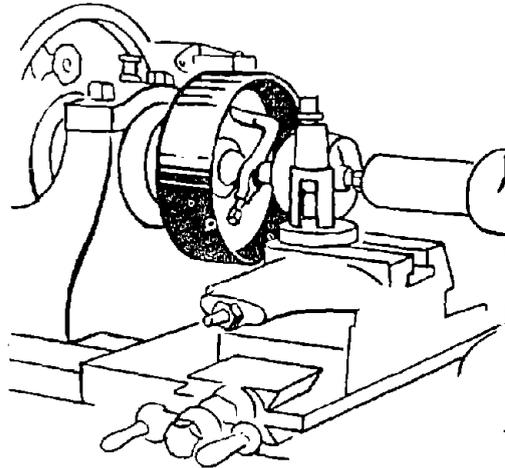


Disc Sander

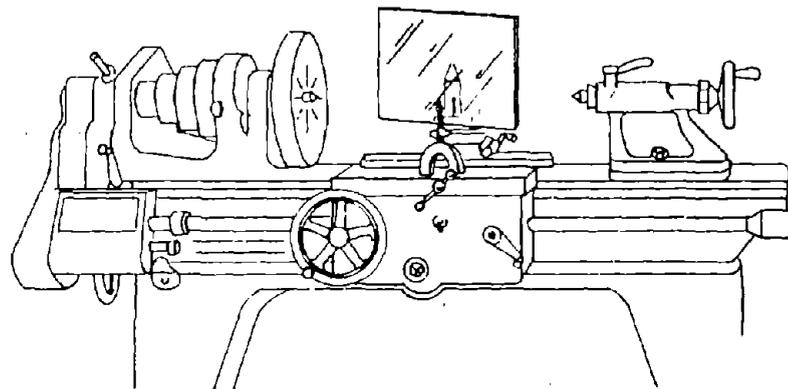
Metal Fabrication Equipment

SPECIFIC GUARDING REQUIREMENTS

LATHES

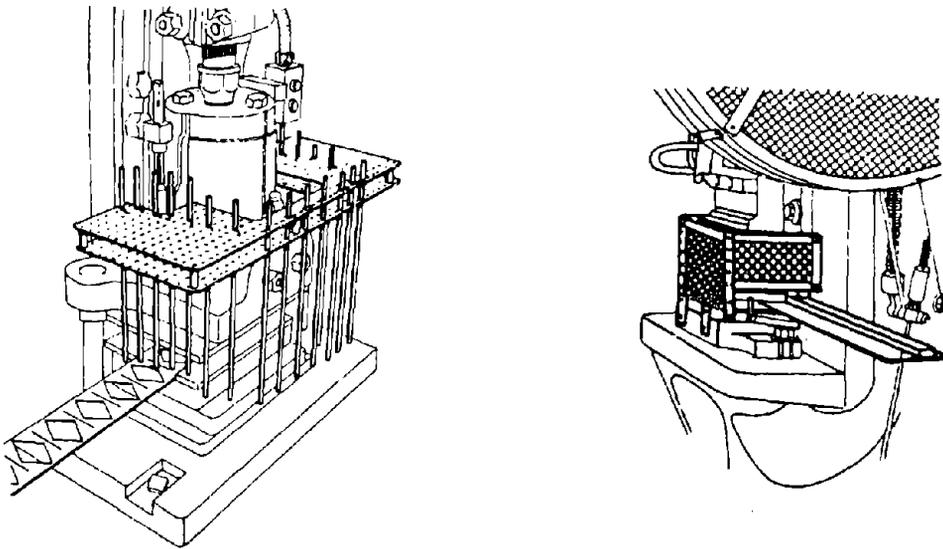


A metal band around the face plate prevents contact with the lathe dog.

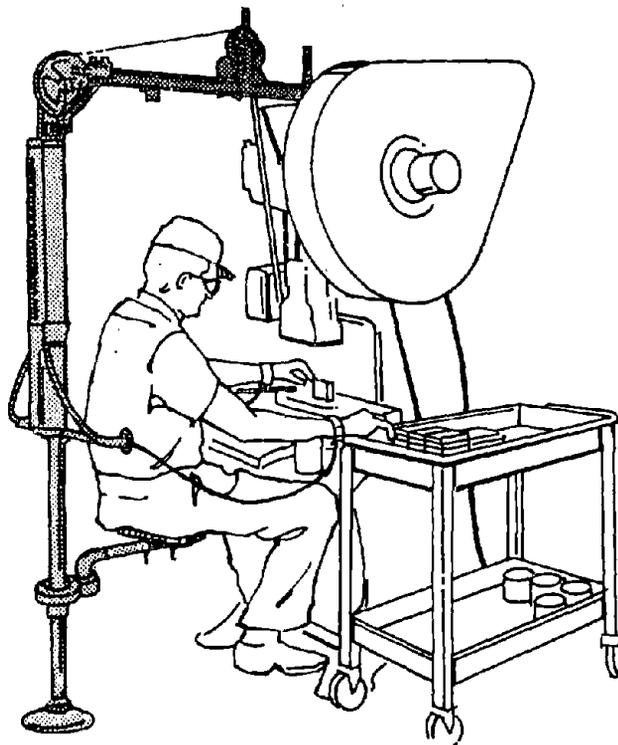


A clear plastic shield held in place by a magnet will protect against flying particles.

PUNCH PRESSES

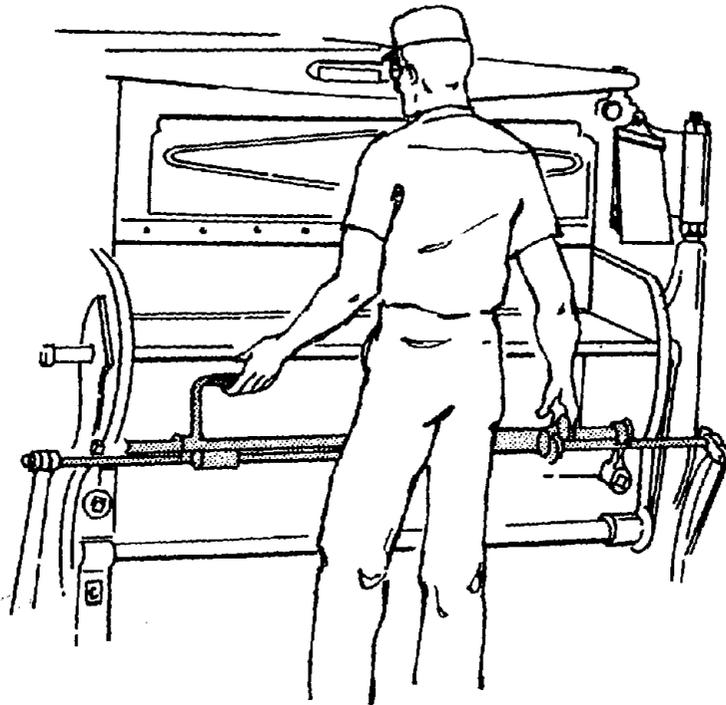


Enclosure guards for punching or forming presses for use with strip feeding.

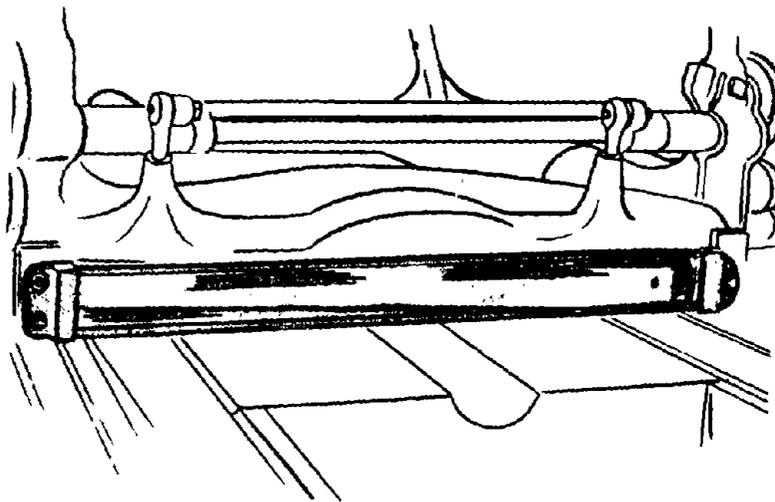


Pull-away guard. Operator's hands are pulled away from danger zone before ram descends.

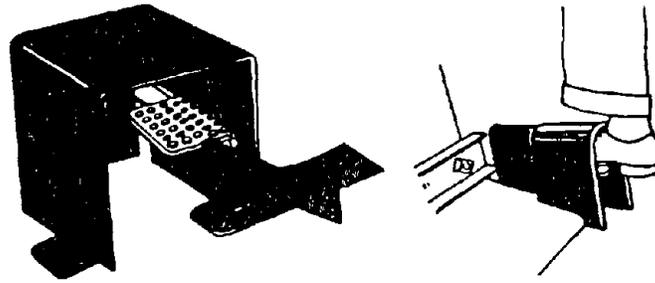
SHEARS



Two-handed tripping device for paper guillotine shear.



Fixed transparent barrier guard for shear.

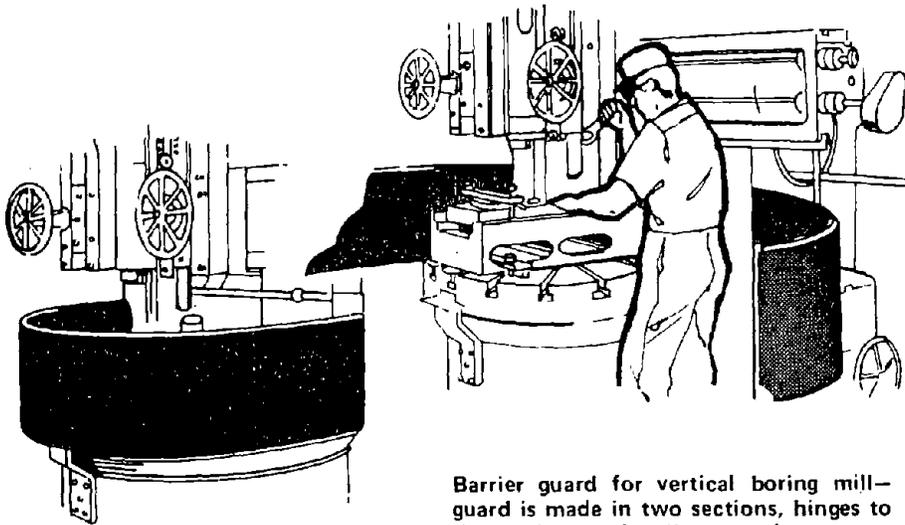


Treadle guards for presses and shears

BORING AND MORTISING MACHINES

Requirements include:

- Safety bit chucks with no projecting setscrews.
- Boring bits and chuck should be completely enclosed above material being worked.
- Top of cutting chain and driving mechanism enclosed.
- Counterweight - acceptable means to prevent its dropping:
 - Bolt through both bar and counterweight.
 - Bolt through extreme end of bar.
 - Safety chain attached if counterweight does not encircle bar.
 - Counterweight suspended by chain or wire rope, must travel in pipe or other enclosure.
- Universal joints on spindles of boring machines completely enclosed.
- Foot treadle protected from accidental tripping by inverted U-shaped metal guard.

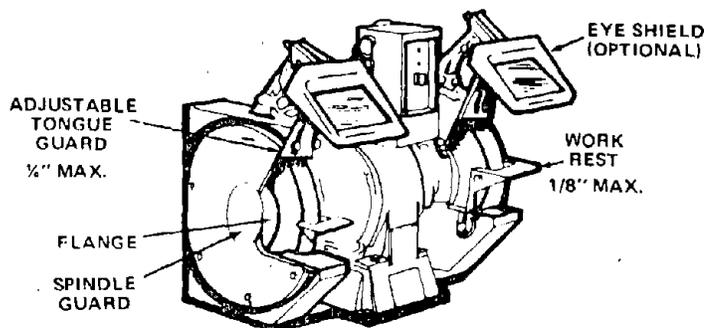


Barrier guard for vertical boring mill—guard is made in two sections, hinges to the machine and easily opened.

Grinders

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

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



Tongue guards (upper peripheral guards) must be constructed so that they adjust to the wheel as it wears down. A maximum clearance of 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 7 feet of the floor, they must be guarded with grille or mesh, limiting openings to not more than 1/2 inch (least dimension).

Air Compressors

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

Hand and Portable Powered Tools

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

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

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

Most hand-held electrical tools must be equipped with a "dead man" or "quick release" control, so that the power is automatically shut off whenever the operator releases the control.

Portable circular saws and portable grinders 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 have its frame grounded or be double-insulated and identified as such.

All tools must be used with appropriate shields, guards, and attachments and in accordance with recommendations by the manufacturers. Employees must be trained in the use of power tools and safety requirements.

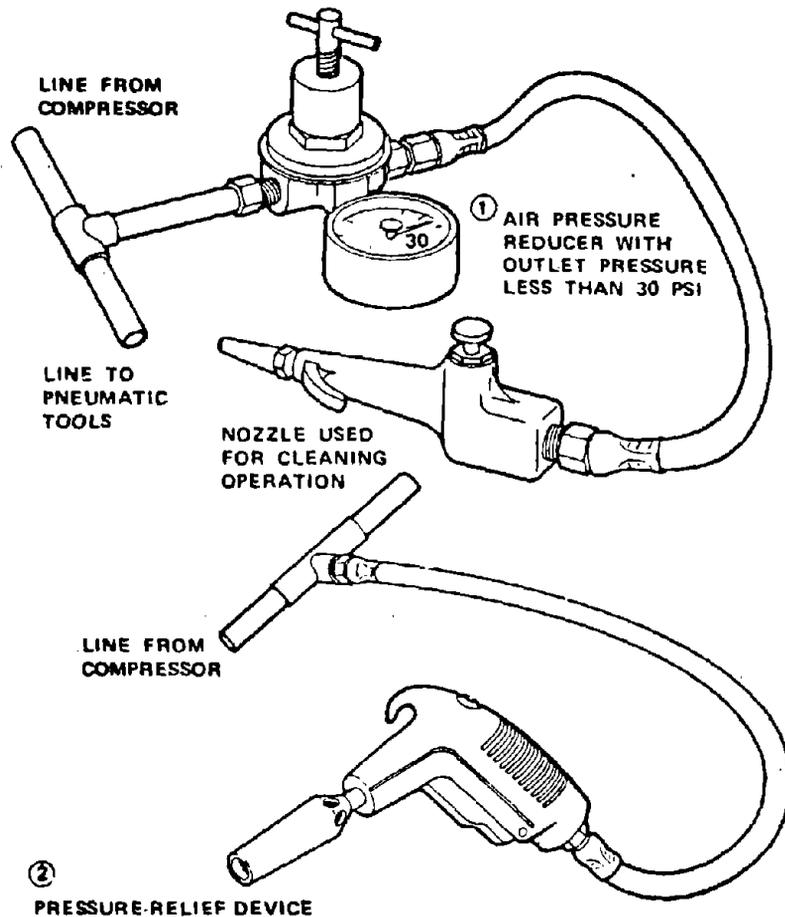
Pneumatic power tools must be positively secured to the hose to prevent the tool from becoming disconnected. A tool retainer must be used on tools to prevent the attachment from being expelled.

Nailers, staplers, and similar equipment with automatic feed should have a muzzle to prevent the tool from ejecting a piece unless the muzzle is in contact with a work surface.

Compressed Air Equipment

Beware of compressed air—it can be dangerous. Alternate methods of cleaning surfaces should be sought. Compressed air must never be used to blow debris from a person. Compressed air may be used if no alternate method of cleaning surfaces is acceptable. The downstream pressure of compressed air must remain at a pressure level 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.



Welding, Cutting, and Brazing

General Requirements

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



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

No welding, cutting, or other hot work may be performed on used drums, barrels, tanks, or other containers until they have been cleaned so thoroughly that it is absolutely certain there are no traces of flammable materials or substances which, when subjected to heat, might produce flammable or toxic vapors.

The atmosphere in the welding area must be free of flammable gases, liquids, and vapors.

Goggles or other suitable eye protection must be used during welding or cutting operations as a protection against radiation produced by the arc and against sparks and debris.



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

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

- Flameproof gauntlet gloves (except when engaged in light work) should be worn. (OSHA may eliminate this and the following two standards. Contact your OSHA area or regional office for more information.)
- Flameproof aprons (leather, for example) may be desirable as protection against sparks and radiant heat.

- Fire resistant leggings or high boots should be worn.

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

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

- stainless steel, lead, zinc, beryllium, or cadmium
- metals coated with lead or mercury-containing materials, such as paint
- fluxes or other materials containing fluorides

These requirements are summarized here:

Welding or Cutting on Materials Containing or Coated With	Location of Operation		
	Confined Spaces	Indoors	Outdoors
Lead	A	B	E
Zinc	A	B	
Fluorine	A	C	C
Cadmium	C	C	F
Beryllium	D	D	D
Mercury	C	C	F
Stainless Steel	(mechanical ventilation adequate to remove the fumes generated)		

- A = Adequate ventilation to prevent the accumulation of toxic fumes or possible oxygen deficiency. Where it is impossible to provide such ventilation, approved airline respirators must be used.
- B = Mechanical local exhaust by means of hoods or booths with sufficient airflow to maintain a velocity, away from the worker, of at least 100 linear feet per minute.
- C = If conditions warrant, mechanical local exhaust (B) or approved airline respirators.
- D = If conditions warrant, mechanical local exhaust (B) and approved respirators.
- E = Approved respirators.
- F = If conditions warrant, approved respirators (E).

Mechanical ventilation must be provided when welding or cutting is done on metals not covered in the table when

- the volume of space per welder is less than 10,000 cubic feet, or
- the ceiling is less than 16 feet high, or
- work is done in confined spaces.

Such mechanical ventilation must be at the minimum rate of 2,000 cubic feet per minute per welder, unless hoods or booths are provided

with sufficient airflow to maintain a velocity, away from the worker, of at least 100 linear feet per minute. Alternatively, NIOSH-approved supplied-air respirators must be used.

Gas Welding

General requirements governing gas welding:

All cylinders must be away from radiators and other sources of heat.

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



Valve protection caps must be used where 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 combustible materials (especially oil or 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. A sheet metal partition is not an acceptable method of separating cylinders.



All cylinder valves must be closed when work is finished. Where a special wrench is required, it must be left in position on the stem of the valve while the cylinder is in use so that the fuel gas flow can be quickly turned off in case of emergency. In the case of manifolded or coupled cylinders, at least one such wrench must always be available for immediate use.

All cylinders must be legibly marked to identify contents.

No cylinder should be permitted to stand alone without being secured with lashing or chain to prevent it from toppling over.

Acetylene must not be used at a pressure in excess of 15 psi gauge (or 30 psi absolute). Above this pressure, acetylene may become unstable.

Indoor storage of fuel gas is limited to a total capacity of 2,000 cubic feet or 300 pounds of liquefied petroleum gas.

Hoses showing leaks, burns, or worn places which make them unfit for service must be replaced or repaired.

Electric Arc Welding

Wherever electric arc welding is done, it is required that:

If the welding machine is wet, it must be thoroughly dried and tested before it is used again.

Coiled welding cable must be spread out and the ground lead must be firmly attached to the work.

Cables must be inspected for damage and loss of insulation and be repaired immediately.

Ground and electrode cables may only be joined together with connectors specifically designed for that purpose.

Cables with splices within 10 feet of the operator may not be used, nor may the operator coil cables around his body.

Welding helmets must be worn by the operator and persons close by must wear eye protection.

Shields or screens must protect others in the vicinity from arc welding rays.

Arc welders should wear clean, fire-resistant gloves and clothing, with collars and sleeves buttoned.

Electrode holders which are not in use must be placed in a safe place away from conductive objects.

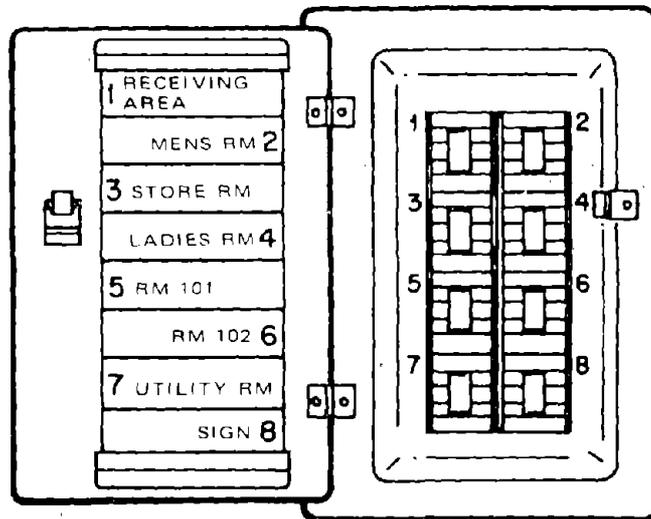
The National Electrical Code (NEC)

Electrical Requirements

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

The National Electrical Code (NFPA 70-1971; ANSI C1-1971) has been adopted as a national consensus standard by OSHA (refer to "Information Sources"). The purpose of the NEC is the practical safeguarding of persons, and buildings and their contents from hazards arising from the use of electricity. The code contains minimum provisions considered necessary for safety. Your electrician or maintenance personnel should be familiar with these 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.

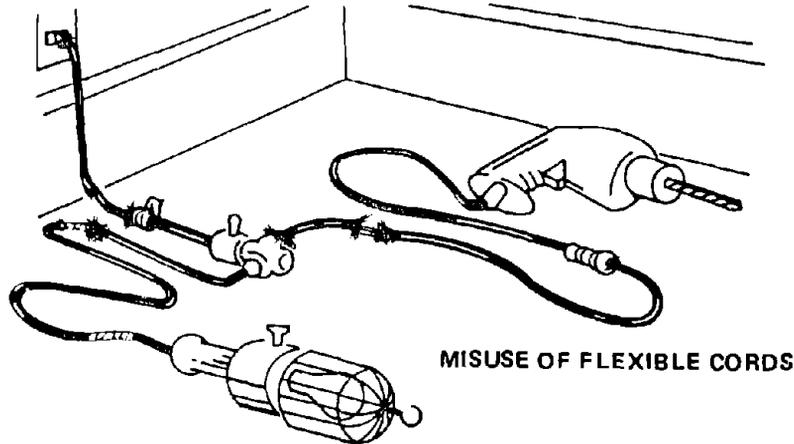
Exposed noncurrent-carrying metal parts of fixed equipment that may become energized under abnormal conditions must be grounded under any of the following circumstances:

- in wet or damp locations;
- if in electrical contact with metal;
- if operated in excess of 150 volts to ground;
- when in a hazardous location.

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

- portable hand-held motor-operated tools;
- appliances;
- any equipment operated in excess of 150 volts to ground.

Outlets, switches, junction boxes, etc., must be covered.



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 brazed, welded, or soldered, or joined with suitable splicing devices. Any splices, joints, and the free ends of conductors must be properly insulated.

RECORDKEEPING REQUIREMENTS

Recordkeeping requirements under OSHA call for factual information about accidents. Employers can use these records to evaluate the success of their safety and health activities and to identify high risk areas of their businesses to which attention should be directed. Employers must report within 48 hours to OSHA (or a state agency in states which have operational safety and health plans) any incident or accident which results in hospitalization of five or more employees or a fatality.

Federal regulations require that employers with 11 or more employees at any time during the preceding calendar year 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 as to lost workdays, restriction of duties or "light duty," and no lost time.

A supplementary record must be completed for each recordable case. OSHA Form 101 may be used; a state workers' compensation report or other form is acceptable if it contains the equivalent information as the OSHA 101. Forms 101 and 200 must be kept current to within six 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 five years, excluding the current calendar year.

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.

The employer should consult with the state occupational safety and health agency (if the state has an approved program) to determine what records are required by the state.

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

job safety and health protection

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

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

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

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

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

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

Complaint: Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace. OSHA will withhold or 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 violation 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 30 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 non-serious violation. Penalties of up to \$1,000 per day may be proposed for failure to correct violations within the specified 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.

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

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

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

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

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



Washington, D. C.
1974
OSHA 2203

Peter J. Brennan
Peter J. Brennan
Secretary of Labor

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

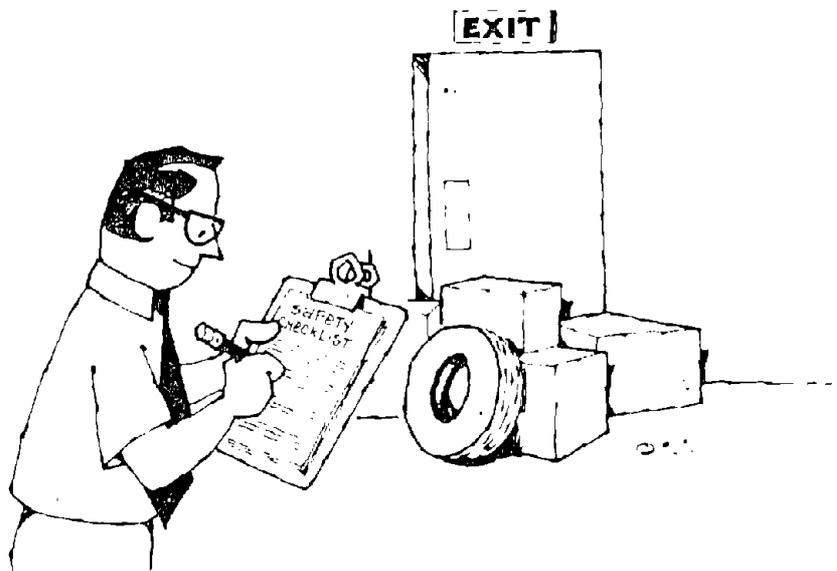
CHECKLISTS

Since the success of a safety and health program depends on identifying hazards and taking immediate remedial action, periodic inspections of the plant are a necessity.

A checklist, such as the one presented on the following pages, can be helpful to management in performing an inspection of the facility. Because businesses vary, it is best that each business develop a customized list from the information in this booklet and a walk-through inspection.

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

References made in the "Checklist" subtitles refer to appropriate sections of Occupational Safety and Health Standards, Code of Federal Regulations, Title 29, Part 1910, which are the OSHA General Industry Standards.



WALKING AND WORKING SURFACES

Aisles and Floor (29 CFR 1910.22)

	Yes	No
Are all places of employment kept clean and orderly? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are floors, aisles, and passageways kept clean and dry and all spills cleaned up immediately? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are floor holes, such as drains, covered? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are permanent aisles appropriately marked? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are wet surface areas covered with nonslip materials? _____	<input type="checkbox"/>	<input type="checkbox"/>

Storage Lofts, Second Floors, Etc. (29 CFR 1910.22, .23)

Are signs showing floor-load capacity present? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are platforms, storage lofts, balconies, etc., that are more than 4 feet above the floor protected with standard guardrails? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are platforms, lofts, and balconies (from which objects may fall and strike people or machinery below) guarded with standard 4-inch toeboards? _____	<input type="checkbox"/>	<input type="checkbox"/>

Stairs (29 CFR 1910.24)

Are there standard stair rails or handrails on all stairways having four or more risers? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all stairways at least 22 inches wide? _____	<input type="checkbox"/>	<input type="checkbox"/>

	Yes	No
Do stairs have at least a 7-foot overhead clearance? _____	<input type="checkbox"/>	<input type="checkbox"/>
Do stairs angle no more than 50° and no less than 30°? _____	<input type="checkbox"/>	<input type="checkbox"/>

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

Have defective ladders (e.g., with broken rungs or side rails) been tagged as "DANGEROUS, DO NOT USE" and removed from service for repair or destruction? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is it prohibited to use the top of an ordinary step ladder as a step? _____	<input type="checkbox"/>	<input type="checkbox"/>
Do fixed ladders have at least 3 1/2 feet of extension at the top of the landing? _____	<input type="checkbox"/>	<input type="checkbox"/>
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? _____	<input type="checkbox"/>	<input type="checkbox"/>
Do all fixed ladders have a pitch of 75° - 90°? _____	<input type="checkbox"/>	<input type="checkbox"/>

**EXITS AND EXIT MARKINGS
(29 CFR 1910.36 - .38)**

Are all exits marked with an exit sign and illuminated by a reliable light source? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is the lettering at least six inches high with the principal letter strokes at least 3/4 of an inch wide? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is the direction to exits, when not immediately apparent, marked with visible signs? _____	<input type="checkbox"/>	<input type="checkbox"/>

	Yes	No
Are doors or other passageways, that are neither exits nor access to an exit and located where they may be mistaken for exits, appropriately marked "NOT AN EXIT", "TO BASEMENT", "STOREROOM", etc.? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are exit doors side-hinged? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all doors that must be passed through to reach an exit always free to access with no possibility of a person being locked inside? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all exit routes always kept free of obstructions? _____	<input type="checkbox"/>	<input type="checkbox"/>

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL (29 CFR 1910.1000)

Control Methods

Is employee exposure to chemicals kept within the acceptable levels? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are eye wash fountains and safety showers provided in areas where chemicals are used? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all containers, such as vats and storage tanks, labeled as to their contents? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is vacuuming used wherever possible rather than blowing or sweeping dust? _____	<input type="checkbox"/>	<input type="checkbox"/>

Paint Spray Operations (29 CFR 1910.107)

Are portable lamps removed during spray operations? _____	<input type="checkbox"/>	<input type="checkbox"/>
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	Yes	No
Do solvents used for cleaning have high flash point (not less than 100°F)? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are fire control sprinkler heads kept clean? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are "NO SMOKING" signs posted in the spray area, paint room, paint booth, and paint storage area? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are the electric motors for exhaust fans placed outside booths or ducts? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are belts and pulleys inside the booth fully enclosed? _____	<input type="checkbox"/>	<input type="checkbox"/>
Do ducts have access doors to allow cleaning? _____	<input type="checkbox"/>	<input type="checkbox"/>
At low temperatures (below 55°), is make-up air heated to at least 65°? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is the make-up air heater located outside the spray booth? _____	<input type="checkbox"/>	<input type="checkbox"/>
Do all drying spaces have adequate ventilation? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is the spray area at least 20 feet from flame, sparks, electric motors, or other ignition sources? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is the spray area free of hot surfaces? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is the spray area kept clean of combustible residue? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are spray booths constructed of metal, masonry, or other substantial noncombustible material? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are spray booth floors and baffles noncombustible and easily cleaned? _____	<input type="checkbox"/>	<input type="checkbox"/>
Do spray booths have explosion-proof lights or are they lighted through sealed clear panels? _____	<input type="checkbox"/>	<input type="checkbox"/>

	Yes	No
Is mechanical ventilation on during spray operations? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is infrared drying apparatus kept out of the spray area during spraying operations? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is the spray area completely ventilated before using the drying apparatus? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is the electric drying apparatus properly grounded? _____	<input type="checkbox"/>	<input type="checkbox"/>

OCCUPATIONAL NOISE EXPOSURE (29 CFR 1910.95)

If a noise problem is suspected, have noise levels been measured? _____	<input type="checkbox"/>	<input type="checkbox"/>
If a noise problem exists, have plans to reduce noise levels by engineering methods been made (e.g., enclosure, maintenance, different methods of processing)? _____	<input type="checkbox"/>	<input type="checkbox"/>
If engineering controls cannot reduce the noise to safe levels:		
1. Have administrative controls, such as limiting worker exposure in a given area, been started? _____	<input type="checkbox"/>	<input type="checkbox"/>
2. Are affected employees given annual audiometric tests, if necessary? _____	<input type="checkbox"/>	<input type="checkbox"/>
3. Do all employees in high-noise areas wear hearing protection? _____	<input type="checkbox"/>	<input type="checkbox"/>
4. Are annual noise surveys made to reevaluate the problem? _____	<input type="checkbox"/>	<input type="checkbox"/>

HAZARDOUS MATERIALS

Flammable and Combustible Liquids (29 CFR 1910.106)

	Yes	No
Are all connections on drums and pipes carrying combustible liquid both vapor and liquid tight? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are flammable liquids kept in closed containers (parts cleaning tanks, pans, etc.) when not in use? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all spills of flammable or combustible liquids cleaned up promptly? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is combustible waste material (oily rags, etc.) stored in covered metal receptacles and disposed of daily? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are bulk drums of flammable liquids grounded and bonded to containers during dispensing? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are gasoline and other flammable liquids stored in approved containers? _____	<input type="checkbox"/>	<input type="checkbox"/>
Do storage rooms for flammable and combustible liquids have explosion-proof lights? _____	<input type="checkbox"/>	<input type="checkbox"/>
Do storage rooms for flammable and combustible liquids have mechanical or gravity ventilation (at least six air changes per hour)? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are storage cabinets for flammable liquids labeled "FLAMMABLE-KEEP FIRE AWAY"? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is there never more than one day's supply of flammable liquids outside of approved storage cabinets or rooms? _____	<input type="checkbox"/>	<input type="checkbox"/>

PERSONAL PROTECTIVE EQUIPMENT (29 CFR 1910.132-137)

	Yes	No
Is personal protective equipment provided, used, and maintained wherever it is necessary? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is employee-owned personal protective equipment, such as gloves, protective shoes, etc., adequate and properly maintained? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are employees required to wear personal protective equipment (gloves, eye protection, respirators, etc.) when handling hazardous materials? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is eye protection available where debris or flying objects could be a hazard? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are ear plugs or muffs provided and worn during noisy conditions? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is slip-resistant footwear worn? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are hard hats or safety shoes available where falling objects could be a hazard? _____	<input type="checkbox"/>	<input type="checkbox"/>

Respiratory Protection Devices (29 CFR 1910.134)

Are approved respirators provided when necessary? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are there written standard operating procedures for the selection and use of respirators? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is the user instructed and trained in the proper use of respirators? _____	<input type="checkbox"/>	<input type="checkbox"/>
Where practicable, is a respirator assigned for use by one employee only? _____	<input type="checkbox"/>	<input type="checkbox"/>

	Yes	No
Are respirators cleaned and disinfected after use? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are respirators stored in a convenient, clean, and sanitary location? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are routinely-used respirators inspected during cleaning? _____	<input type="checkbox"/>	<input type="checkbox"/>

GENERAL ENVIRONMENTAL CONTROLS

Sanitation (29 CFR 1910.141)

Are restrooms and washrooms kept in clean and sanitary condition? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are covered receptacles for waste food kept in clean and sanitary condition? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is all water that is provided for drinking, washing, and cooking suitable for drinking? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all outlets for water that is not suitable for drinking clearly posted as "UNSAFE FOR DRINKING, WASHING, OR COOKING"? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are employees prohibited from eating in areas where toxic materials are present? _____	<input type="checkbox"/>	<input type="checkbox"/>
Has pest control been exercised? _____	<input type="checkbox"/>	<input type="checkbox"/>
If employees are permitted to eat on the premises, are they provided with a suitable eating space? _____	<input type="checkbox"/>	<input type="checkbox"/>

MEDICAL AND FIRST AID (29 CFR 1910.151)

	Yes	No
Are first aid supplies readily available, inspected, and replenished? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is at least one employee on each shift qualified to render first aid, if there is no nearby clinic or hospital? (Some states require trained individuals in first aid, regardless of nearby clinics or hospitals). _____	<input type="checkbox"/>	<input type="checkbox"/>
Are first aid personnel also trained for hazards specific to the manufacture of textile machinery? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are first aid supplies approved as adequate by a consulting physician? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is there a first aid kit accessible in the work area? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are medical personnel readily available for advice and consultation on matters of employee health? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are emergency phone numbers posted? _____	<input type="checkbox"/>	<input type="checkbox"/>
Where employees may be exposed to corrosive materials, are they provided with quick drenching and flushing facilities for immediate emergency use? _____	<input type="checkbox"/>	<input type="checkbox"/>

FIRE PROTECTION (29 CFR 1910.157,.159,.160)

Are the extinguishers selected for the types of combustibles and flammables in the areas where they are to be used?

- Class A. ordinary combustible material fires
- Class B. flammable liquid or grease fires
- Class C. energized electrical equipment fires

	Yes	No
Are extinguishers located along normal paths of travel? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are extinguisher locations not obstructed or blocked? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are extinguishers not mounted too high? If less than 40 pounds, the top must not be higher than 5 feet above floor; greater than 40 pounds, the top must not be higher than 3 1/2 feet above floor. _____	<input type="checkbox"/>	<input type="checkbox"/>
Have all extinguishers been serviced, maintained, and tagged at intervals not to exceed one year? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all fire extinguishers checked monthly by a designated employee or an extinguisher service to see if the extinguishers are in place or if they have been discharged, etc.? _____	<input type="checkbox"/>	<input type="checkbox"/>

Automatic Sprinkler (if applicable)

Is there at least one automatic water supply of adequate pressure, capacity, and reliability? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are piles of combustible materials kept at least 36 inches from sprinkler heads? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are water-flow alarms provided on all sprinklers? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are the sprinkler systems periodically inspected and continuously maintained? _____	<input type="checkbox"/>	<input type="checkbox"/>

Dry Chemical Systems (if applicable)

Does a competent inspector make annual inspections and perform tests on all dry chemical systems? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are the inspector's reports kept on file? _____	<input type="checkbox"/>	<input type="checkbox"/>

	Yes	No
Are visual inspections regularly made? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all dry chemical systems maintained in full operating condition at all times? _____	<input type="checkbox"/>	<input type="checkbox"/>

COMPRESSED AIR (29 CFR 1910.169)

Are pulleys and belts on compressors and motors completely guarded? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are flexible cords or plugs on electric motors periodically checked and replaced if in a deteriorated condition? _____	<input type="checkbox"/>	<input type="checkbox"/>
Do the relief valves operate properly? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are air tanks drained regularly? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are the pressure-relief device and gauge in good operating condition? _____	<input type="checkbox"/>	<input type="checkbox"/>

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

Is there safe clearance for equipment through aisles and doorways? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is stored material stable and secure? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are storage areas free from tripping hazards? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are only trained operators allowed to operate powered lift trucks? _____	<input type="checkbox"/>	<input type="checkbox"/>

	Yes	No
Are appropriate overhead guards installed on powered lift trucks? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is battery charging on electric units performed only in designated areas? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are "NO SMOKING" signs posted near electric battery charging units? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all vehicles shut off prior to loading? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are dock boards (bridge plates) used when loading or unloading between dock and truck or rail car? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are containers of combustibles or flammables, when stacked one upon the other, always separated by dunnage sufficient to provide stability? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are racks and platforms never loaded beyond their capacity? _____	<input type="checkbox"/>	<input type="checkbox"/>
If motorized equipment such as lift trucks is used, are aisles permanently marked, providing sufficient clearance for the equipment? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are maximum loads posted for floors (except slabs with no basements)? _____	<input type="checkbox"/>	<input type="checkbox"/>

Cranes (29 CFR 1926.550, 1910.179-.180)

Are operators properly trained and are they following the manufacturer's specifications and limitations for the equipment? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are proper hand signals being used? _____	<input type="checkbox"/>	<input type="checkbox"/>

	Yes	No
Are special hazard warnings or instructions posted on equipment and visible to the operator? _____	<input type="checkbox"/>	<input type="checkbox"/>
Has equipment been inspected and any deficiencies corrected prior to use of equipment? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are barricades adequate around the swing radius of revolving superstructures? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is the equipment 10 feet or more (0.4 inches for each 1 kV over 50) away from any line of 50 kV or more? _____	<input type="checkbox"/>	<input type="checkbox"/>
Have appropriate precautions been taken (de-energizing line) for work which is close to power lines? _____	<input type="checkbox"/>	<input type="checkbox"/>

MACHINERY AND MACHINE GUARDING (29 CFR 1910.212)

Are belts, pulleys, and rotating shafts (air compressor, drill presses, etc.) properly guarded? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are chains, sprockets, and gears properly guarded? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all nip points properly guarded? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are rotating shafts that are not smooth properly guarded? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all rotating parts (lubrication, fittings, etc.) recessed or covered with collars? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are sprockets and V-belt drives which are within reach of platforms and passageways or within 7 feet of the floor completely enclosed? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are fans less than 7 feet above floor guarded, with openings 1/2 inch or less? _____	<input type="checkbox"/>	<input type="checkbox"/>

Abrasive Wheel Machinery (Grinders)
(29 CFR 1910.215)

	Yes	No
Is the work rest used and kept adjusted to within 1/8 inch of wheel? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is the adjustable tongue on top side of grinder used and kept adjusted to within 1/4 inch of wheel? _____	<input type="checkbox"/>	<input type="checkbox"/>
Do side guards cover the spindle, nut, and flange and 75% of the wheel diameter? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are bench and pedestal grinders permanently mounted? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are goggles or face shields always worn when grinding? _____	<input type="checkbox"/>	<input type="checkbox"/>

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

Are tools and equipment (both company- and employee-owned) in good condition? _____	<input type="checkbox"/>	<input type="checkbox"/>
Have mushroomed heads on chisels, punches, etc., been reconditioned or replaced if necessary? _____	<input type="checkbox"/>	<input type="checkbox"/>
Have broken hammer handles been replaced? _____	<input type="checkbox"/>	<input type="checkbox"/>
Have worn or bent wrenches been replaced? _____	<input type="checkbox"/>	<input type="checkbox"/>
Have employees been instructed not to use compressed air to blow debris from clothing or body because it can enter the body and cause serious harm? _____	<input type="checkbox"/>	<input type="checkbox"/>
Have deteriorated air hoses been replaced? _____	<input type="checkbox"/>	<input type="checkbox"/>

	Yes	No
Are portable abrasive wheels appropriately guarded? _____	<input type="checkbox"/>	<input type="checkbox"/>
Have employees been made aware of the hazards caused by faulty or improperly used hand tools? _____	<input type="checkbox"/>	<input type="checkbox"/>
Have employees been instructed not to use compressed air for cleaning purposes? _____	<input type="checkbox"/>	<input type="checkbox"/>

WELDING, CUTTING, AND BRAZING (29 CFR 1910.252)

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? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are cylinders secured and stored where they cannot be knocked over? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are cylinder protective caps in place except when the cylinder is in use? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are compressed gas cylinders kept away from sources of heat, elevators, stairs, or gangways? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are only instructed employees, who are judged competent by the employer, allowed to use oxygen or fuel gas equipment? _____	<input type="checkbox"/>	<input type="checkbox"/>
Do all cylinders (except those with fixed hand wheels) have non-adjustable wrenches, keys, or handles in place on valve stems while cylinders are in use? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is welding always conducted at a safe distance from flammable liquids? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all compressed gas cylinders legibly marked for identifying the content? _____	<input type="checkbox"/>	<input type="checkbox"/>

	Yes	No
Are the valves shut off when the cylinder is not in use? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are flash shields provided to protect nearby workers from the welding flash? _____	<input type="checkbox"/>	<input type="checkbox"/>

NATIONAL ELECTRICAL CODE

Electrical Wiring

Have exposed wires, frayed cords, and deteriorated insulation been repaired or replaced? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are junction boxes, outlets, switches, and fittings covered? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is all metal fixed electrical equipment grounded? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are flexible cords and cables fastened so that there is no direct pull on joints or terminal screws? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are flexible cords and cables never substituted for fixed wiring? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are flexible cords and cables not attached to building surfaces? _____	<input type="checkbox"/>	<input type="checkbox"/>
Do flexible cords and cables not run through holes in wall or ceiling or through doorways or windows? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are flexible cords and cables free from splices or taps? _____	<input type="checkbox"/>	<input type="checkbox"/>
Does all equipment connected by cord and plug have grounded connections? _____	<input type="checkbox"/>	<input type="checkbox"/>

	Yes	No
Are electrical appliances such as vacuums, polishers, vending machines, etc., grounded? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all portable electrical hand tools grounded? (Double-insulated tools are acceptable without grounding.) _____	<input type="checkbox"/>	<input type="checkbox"/>
Are breaker switches identified as to their use? _____	<input type="checkbox"/>	<input type="checkbox"/>

RECORDKEEPING (29 CFR 1904.2-.8)

Is employee poster (OSHA or equivalent state poster) prominently displayed? _____	<input type="checkbox"/>	<input type="checkbox"/>
Has a summary of all occupational injuries and illnesses been compiled at the conclusion of each calendar year and been recorded on OSHA Form No. 200? Was it posted during the month of February? _____	<input type="checkbox"/>	<input type="checkbox"/>
Have all OSHA records been retained for a period of 5 years, excluding the current year? _____	<input type="checkbox"/>	<input type="checkbox"/>
Have occupational injuries or illnesses, except minor injuries requiring only first aid, been recorded on OSHA Form Nos. 100 and 101, or equivalent? _____	<input type="checkbox"/>	<input type="checkbox"/>
Have requirements for recordkeeping been confirmed with state occupational safety and health office, if your state has an approved program? _____	<input type="checkbox"/>	<input type="checkbox"/>

Information Sources

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

- A12.1 Floor and Wall Openings
- A14.1 Portable Wood Ladders
- A58.1 Minimum Design Load
- A64.1 Fixed Stairs
- B11.1 Care and Use of Mechanical Power Presses
- B15.1 Mechanical Power Transmission
- B30 Cranes and Hoists
- B30.9-1971 Slings
- B30.16-1973 Overhead Hoists
- C1 National Electrical Code
- Z4.1 Sanitation in Places of Employment
- Z49 Welding and Cutting
- Z87.1 Eye and Face Protection
- Z88.1, 88.2 Respiratory Protection

**NATIONAL FIRE PROTECTION ASSOCIATION
470 Atlantic Avenue
Boston, Mass, 02110**

- NFPA-10-1970 Installation of Portable Fire Extinguishers
- NFPA-101-1970 Life Safety Code
- NFPA-13A-1971 Sprinkler Systems, Maintenance
- NFPA-70-1971 National Electrical Code

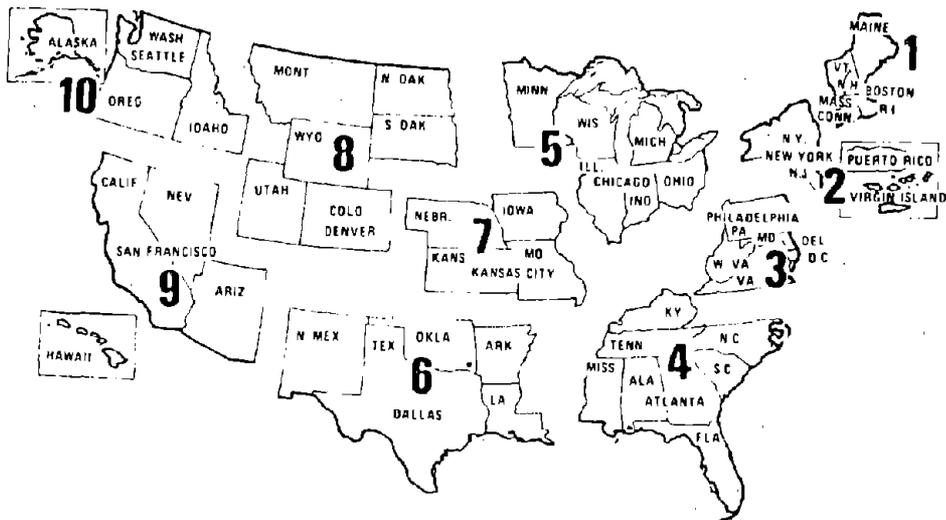
**NATIONAL SAFETY COUNCIL
444 North Michigan Avenue
Chicago, Illinois 60611**

NIOSH and OSHA regional directors, trade associations, state and local governmental agencies, and insurance companies can provide useful information. The Small Business Administration will provide information concerning procedures for securing economic assistance in complying 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.

REGIONS



NIOSH REGIONAL OFFICES

DHEW, Region I
Government Center (JFK Fed. Bldg.)
Boston, Massachusetts 02203

Tel: 617/223-6668/9

DHEW, Region VI
1200 Main Tower Building
Dallas, Texas 75202

Tel.: 214/655-3081

DHEW, Region II— Federal Building
26 Federal Plaza
New York, New York 10007

Tel: 212/264-2485/8

DHEW, Region VII
601 East 12th Street
Kansas City, Missouri 64106

Tel.: 816/374-5332

DHEW, Region III
3525 Market Street, P.O. Box 13716
Philadelphia, Pennsylvania 19101

Tel: 215/596-8716

DHEW, Region VIII
19th & Stout Streets
9017 Federal Building
Denver, Colorado 80202

Tel.: 303/837-3979

DHEW, Region IV
50 Seventh Street, N.E.
Atlanta, Georgia 30323

Tel: 404/526-5474

DHEW, Region IX
50 Fulton Street (223 FOB)
San Francisco, California 94102

Tel.: 415/556-3781

DHEW, Region V
300 South Wacker Drive
Chicago, Illinois 60607

Tel: 312/353-1710

DHEW, Region X
1321 Second Avenue (Arcade Bldg.)
Seattle, Washington 98101

Tel.: 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 507
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

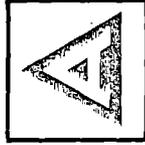
U.S. Department of Labor
Occupational Safety and Health Administration
6048 Federal Office Building, 909 First Avenue
Seattle, Washington 98174 Telephone: 206/442-5930

KIND OF FIRE

DECIDE THE CLASS OF FIRE YOU ARE FIGHTING. . .



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



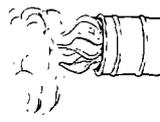
CLASS A FIRES
USE THESE EXTINGUISHERS

- ORDINARY COMBUSTIBLES
- WOOD
 - PAPER
 - CLOTH, ETC.



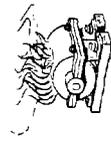
CLASS B FIRES
USE THESE EXTINGUISHERS

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



CLASS C FIRES
USE THESE EXTINGUISHERS

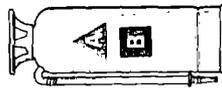
- ELECTRICAL EQUIPMENT
- MOTORS
 - SWITCHES, ETC.



APPROVED TYPE OF EXTINGUISHER

MATCH UP PROPER EXTINGUISHER WITH CLASS OF FIRE SHOWN AT LEFT

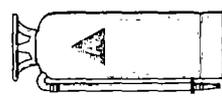
FOAM
Solution of Aluminum Sulphate and Bicarbonate of Soda



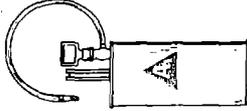
CARBON DIOXIDE
Carbon Dioxide Gas Under Pressure



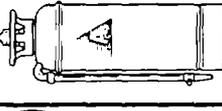
SODA ACID
Bicarbonate of Soda Solution and Sulphuric Acid



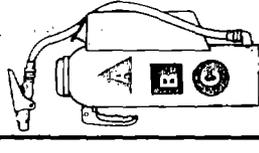
PUMP TANK
Plain Water



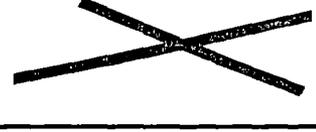
GAS CART-RIDGE
Water Expelled by Carbon Dioxide Gas



MULTI-PURPOSE DRY CHEMICAL



ORDINARY DRY CHEMICAL



HOW TO OPERATE

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



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



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



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



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



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

HOW TO LIFT SAFELY

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

The factors that contribute to safe lifting are:

1. Approach the load and size it up (weight, 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.

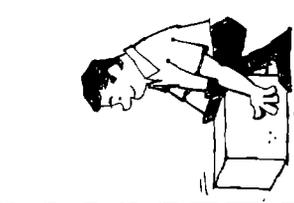
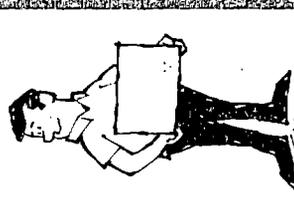
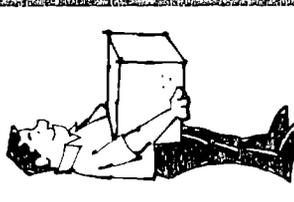
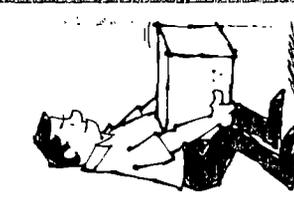
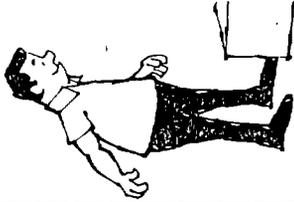
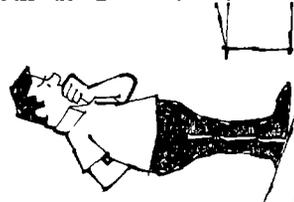
3. Bend the knees to the degree that is comfortable and get a good handhold. Then using both leg and back muscles.

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

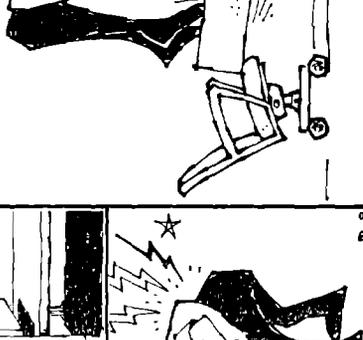
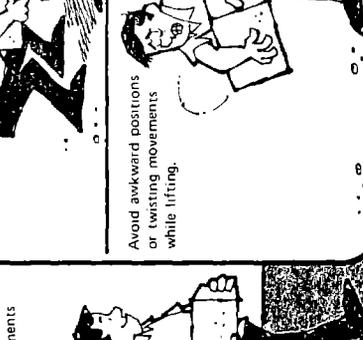
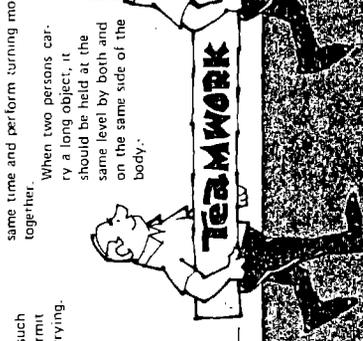
5. Lift the object into carrying position, making no turning or twisting movements until the lift is completed.

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

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



DETERMINE IF OBJECT CAN BE SAFELY HANDLED



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

When lifting and carrying with another person—teamwork is important. The load should be equally distributed. Movements must be coordinated so you both start and finish the lift action at the same time and perform turning movements together.

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

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

Over-reaching and stretching to reach overhead objects may result in strains or falls. Use a ladder instead of chairs, boxes, etc.

Avoid awkward positions or twisting movements while lifting.

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

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. _____

