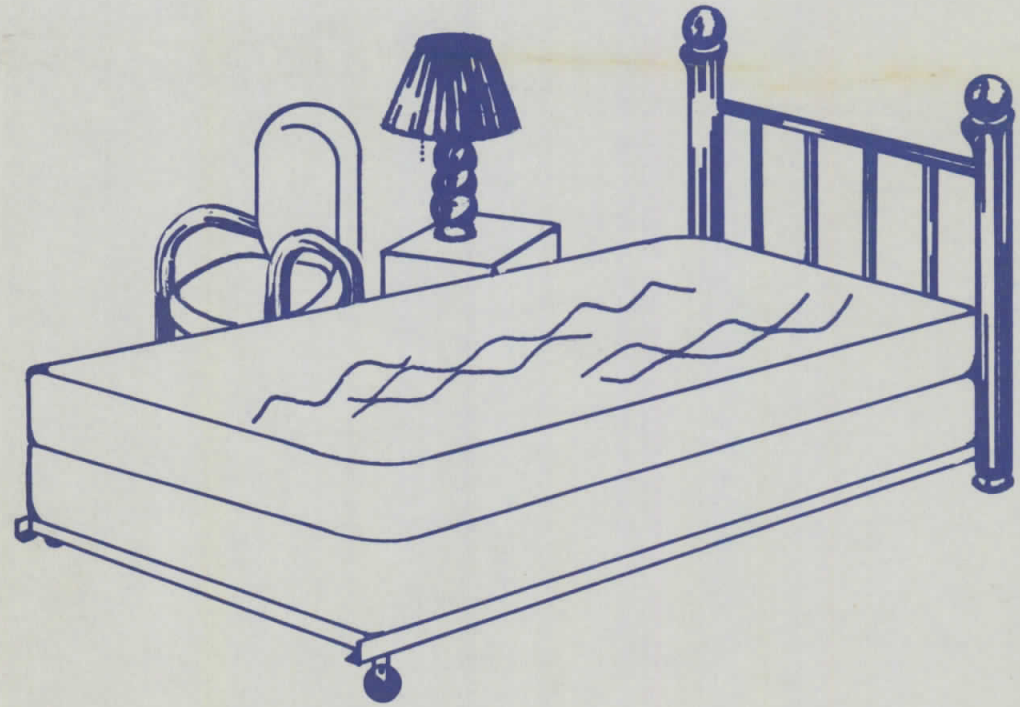
NIOSH

Health and Safety Guide for Metal Furniture and Mattress Manufacturers



U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
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NIOSH HEALTH AND SAFETY GUIDES

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HEALTH AND SAFETY GUIDE FOR METAL FURNITURE AND MATTRESS 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
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INTRODUCTION

The Williams-Steiger "Occupational Safety and Health Act of 1970" was passed into law "to assure safe and healthful working conditions for working men and women . . ." This Act established the National Institute for Occupational Safety and Health (NIOSH) in the Department of Health, Education, and Welfare (DHEW) and the Occupational Safety and Health Administration (OSHA) in the Department of Labor (DOL). The Act provides for research, informational programs, education, and training in the field of occupational safety and health and authorizes the enforcement of standards. As part of these activities, surveys have been made by NIOSH to determine the most common health and safety problems in small businesses. This booklet was written primarily for those businesses engaged in the manufacture of metal furniture and/or mattresses.

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

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

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

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

HEALTH AND SAFETY GUIDELINES

GENERAL PHILOSOPHY FOR HEALTH AND SAFETY COMPLIANCE

By doing a thorough analysis of the workplace for health and safety hazards, existing unsafe acts or conditions should become apparent. Many conditions are covered by specific standards. For those hazardous conditions or practices which arise during the manufacture of metal furniture & mattresses 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." Therefore, it is important to find solutions to all "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 to all concerned that the "intent" of the law is being met, a variance from the applicable standard may be requested from OSHA. If an employer receives a visit from OSHA, it is important that the employer have demonstrated his willingness to comply with the intent of the law by the operation of an effective, ongoing safety and health program, correction of existing hazards in the workplace, and maintenance of records of purchases, installations, and other compliance-promoting activities.

HEALTH AND SAFETY PROGRAM

As was indicated, 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 self-inspection, soliciting employee input (interviews, suggestions, and complaints), prompt investigation of accidents, review of injury and illness records, and use of safety and health references (NIOSH Health and Safety Guides, NSC data sheets).

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

EMPLOYEE TRAINING

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

1. Employees should understand the need for constant attention to their working environment, even during automatically controlled operations.
2. 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, dusts).
3. Instruct employees 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).
4. Train employees in the proper use of protective equipment, particularly respirators (see "Personal Protective Equipment").
5. Train employees in good personal hygiene practices. Admonish employees to thoroughly wash their faces, hands, and arms prior to eating or smoking to prevent inadvertent ingestion of toxic substances.
6. Promote "good housekeeping." 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.

7. Train employees in the use of forklifts, cranes, trucks, and other powered equipment. This should include safety precautions, signals, etc.
8. Instruct employees 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.
9. Provide first aid training for at least one worker on each shift. Approved courses are offered by the American Red Cross and the Bureau of Mines.
10. Instruct employees in safe lifting. An easily understood chart, "How to Lift Safely," is included in the back of this book.

GENERAL INFORMATION ABOUT METAL (OFFICE AND HOUSEHOLD) FURNITURE AND MATTRESS MANUFACTURERS

In the evaluation of the health and safety records for manufacturers of metal furniture and mattresses, illness and injury statistics compiled by the Bureau of Labor Statistics were reviewed. The incidence rate (I.R.) for injuries and illnesses is regarded as a significant index in this assessment.

$$\text{I.R.} = \frac{\text{No. of injuries and illnesses} \times 200{,}000}{\text{hours worked (all employees)}}$$

MANUFACTURE TYPE	STANDARD INDUSTRIAL CLASSIFICATION (SIC)	INCIDENCE RATE TOTAL CASES (Cases/100 full-time employees) 1974 (1973)	LOST WORKDAYS (days/100 full-time employees) 1974 (1973)
All	2011-3999	14.6 (15.3)	72.7 (68.2)
Metal Household Furniture	2514	18.7 (20.8)	82.0 (86.4)
Mattresses and Bedsprings	2515	17.2 (20.2)	78.9 (83.9)

A review of the table indicates that for both manufacturers of metal furniture, and mattresses and bedsprings, the incidence rates for injuries and illnesses are above the average for all manufacturing. Lost workdays (per 100 full-time employees) for both groups are also above the average for all manufacturing. Seventy-five percent of the total cases (for all manufacturing types) involve injuries which resulted from:

1. being struck by and/or striking against objects, including falling or flying objects,
2. falls, slips, and trips (with fifty percent due to wet, oily, or littered surfaces), or
3. strain and overexertion.

Metal furniture manufacturing, whether for the office or home, is essentially a fabrication process. Shaped steel, such as bar steel, angle steel, wrought iron, sheet metal, etc., undergoes shearing, punching, bending, welding, assembling, and painting processes until the final piece of furniture is ready for distribution. Manufacture of mattresses and bedsprings involves similar operations, with the large mattress manufacturers also processing their own cotton from bales.

Machinery found in the metal furniture manufacturing industry includes alligator shears and power shears, metal "cut-off" saws or machines, press brakes and preframe brakes, punch presses, bending and forming machines (e.g., "tube-benders"), and drill presses. The use of these and other machineries, unless properly guarded, may present a safety hazard to employees. (See "Machine Guarding.")

Welding of all types is found in this industry. Upon completion of initial metalworking, welding is an integral part of the assembling process. In addition to gas and electric arc welding, joining metals by resistance welding is also done. Resistance welding machines may be used with various feeding, clamping, and ejecting devices which may require guarding of points of operation and nip points. (See "Welding and Cutting.")

Degreasing solvents (e.g., trichloroethylene, 1,1,1 trichloroethane) are frequently used in the cleaning of metal parts prior to spray painting. Another method is to employ an automatic system using a four-step process:

1. phosphate soap solution
2. clean water rinse
3. chromic acid rinse
4. rust remover (optional)

The manufacturing of innersprings, box springs, non-innerspring mattresses, and dual purpose sleepware (such as studio couches and sofa beds) involves similar machine processes as those for metal furniture. In the production of sofa beds, the lower steel units are pressed, cut, and riveted. Gang presses and shears are also used. A great deal of hand riveting is done, and high noise levels may be a problem. Specialty machines used include fabric machines, where steel nets are made from wire and used to hold the mattress in the sofa bed, and tufting machines, where sofa bed or rollaway bed mattresses are tufted with buttons by machine. The lower units are usually dipped in enamel paint. Some companies, however, use spray painting.

The construction of the spring units in innerspring mattresses may vary with the manufacturer, but the assembly of the innerspring mattress is standard. Foam or cotton pads are fitted around the spring unit, with this assembly then fitted with an outside cover. Specialty machinery found in this type of manufacturing includes:

1. Quilting machines — sews and quilts filling and cover
2. Closing machines — sews cover and puts tape edging around mattress
3. Coiling machines — forms coils from wire
4. Panel cutters — cuts material for the sides (panels) of mattresses
5. Vent machines — puts vents on mattress panels

In the construction of box spring mattresses, the coils are automatically stapled to the wooden base, and a hydraulic press forces the coils down while the cover is stapled to the base.

Processes found in mattress manufacturing companies are similar to those above and, as previously mentioned, may also include the processing of bales of cotton. The cotton pads are made from baled cotton, usually in a separate area of the plant. Cotton picking machines and garnetting machines are used in the making of the mattress pad. The baled cotton must be cleaned of debris and the fibers straightened and layered to the correct thickness before the pad is made. The garnetting machines and cotton picking machines, with their many moving parts, can present many hazards unless they are properly guarded. Some potential danger points are: feedrolls, worker-rollers, combing cylinders, belts, gears, shaft ends, and pulleys. If foot pedals are used, treadle guards must be installed. Precautions must be taken to prevent accidental starting of a machine during maintenance work, particularly cleaning. Additionally, the generation of cotton dust in the workroom air by the fabrication process may be a respiratory hazard.

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL

In some cases, health hazards are not recognized because some toxic 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 manufacurer 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.

In identifying occupational health hazards, a job hazard analysis 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., whether 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 undertaken for each operation of the manufacturing process, or may be done on a general basis — by department. The following job health hazard analyses illustrate a survey of a garnetting operation in mattress manufacturing, and a partial workplace survey of a metal furniture manufacturer. The survey should evaluate present conditions.

Figure 1
JOB HEALTH HAZARD ANALYSIS
Operation: Garnetting

Number of employees	Job title	Exposure substance	Form(s)[1]	Route of entry[2]	Control[3]
3	Machine Operators	Cotton	D	I	GV
		Noise (92dBA)			None
		No. 3 Machine Oil	L	S	G (Leather)
		Grease	L	S	G (Leather)

Codes:
[1]Form
D—Dust
L—Liquid
V—Vapor
G—Gas
F—Fume

[2]Exposure Route
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)

Figure 2
WORKPLACE HEALTH HAZARD ANALYSIS

Department	Job description	Exposure substance (chemical name or trade name)	Form(s)[1]	Control[2]	Remarks
	Punch Press Operator	Noise		None	96dBA
	Material Handler	Oil (from metal surface)	L	None	
3		Combustion Products-Propane	G	GV	from Fork Lift
		Oil	L	None	
		Combustion Products-Propane	G	GV	
	Maintenance (work throughout	Combustion Products-Propane	G	GV	
				None	90-100dBA
10	plant)	Noise (throughout plant)	D	GV	
		Grinding Wheel Dust Iron;	L	None	
		Stoddard Solvent	V	GV	
	Welding	NO_X, Ozone, CO,	G	GV	
		Ultraviolet Light		O	Helmet, Gloves, Apron
12		Iron Oxide	F	GV	
		Acetylene	G	GV	
		Infrared Radiation		O	Helmet, Gloves, Apron
	Metal Cleaning	ABC Cleaning Compound	L	G (rubber)	
			V	LV	
16		Chromic Acid	M	LV	
			L	G (neoprene)	

[1]Forms:
D—Dust
L—Liquid
M—Mist
V—Vapor
G—Gas
F—Fume
S—Splash

[2]Controls:
LV—Local Ventilation
GV—General Ventilation
R—Respirator (Type)
G—Gloves (Type)
F—Face Protection
O—Other Protection (Type)

Related activities, such as maintenance and service operations, should also be examined for health hazard potential. Some examples of unsuspecting hazards to watch for are:

1. Welding performed around chlorinated materials may cause the formation of toxic gases in addition to welding fumes.
2. If fork lift trucks with internal combustion engines are used for materials handling, hazardous exhaust gases, such as carbon monoxide, will be generated.
3. When certain cleaning agents are mixed, poisonous gases, such as chlorine, are sometimes formed.

After completion of the job analysis survey, all exposure substances listed should be examined for hazard potential and adequacy of control. Safety data sheets and toxicology references can be used for initial evaluation. Measurement of levels of air contaminants and evaluation of adequacy of controls (particularly ventilation) may require outside consultation. Having ascertained the above data, suitable methods of control should be implemented (if required).

CONTROL OF EXPOSURE TO HAZARDOUS SUBSTANCES

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

1. Substitution of less toxic materials—e.g., use of 1,1,1,trichloroethane for carbon tetrachloride.
2. Change of a process—an operation performed manually, now automated.
3. Isolation—enclosing or placing the hazardous process in a separate room or in a corner of the building to reduce the number of persons exposed. Remote or automated controls should be considered.
4. 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.

5. Administrative controls—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.
6. Training and education of employees—telling employees what hazardous air contaminants they are exposed to and how to reduce or limit exposure. (See "Employee Training.")
7. Personal hygiene—clothing should be changed and washed if it becomes contaminated with toxic chemicals, dusts, fumes, or liquids.
8. 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:

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

FREQUENTLY VIOLATED REGULATIONS

WALKING AND WORKING SURFACES

General Requirements

1. All work areas, passageways, storerooms, and service rooms must be kept clean, orderly, sanitary, and as dry as possible. All spills should be cleaned up promptly. Floors in work areas must be kept free of scrap, chips, oil spills, and other debris.
2. Areas which are constantly wet should have nonslip surfaces or mats where employees must walk or work.
3. Every floor, working place, and passageway must be maintained free from protruding nails, splinters, holes, and loose boards.
4. Where mechanical handling equipment (such as lift trucks) is used, sufficient safe clearance must be provided for foot and vehicular traffic.
5. No obstructions that could create a hazard are permitted in the aisles.
6. All permanent aisles must be easily recognizable.
7. Floorload capacities must be posted in a readily visible location (except for slab floors with no basement). 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 Guard Rail and Toeboard

1. A standard guard railing consists of a top rail, intermediate rail, and posts. The nominal distance from the upper surface of the top rail to the floor, platform, runway, or ramp must be 42 inches. There must be an intermediate rail spaced approximately halfway between the top rail and the floor.
2. A standard guard railing can be of any configuration and construction that meets the basic dimension requirements

(42 inches high with midrail), and can withstand 200 pounds applied in any direction at any point on the top rail.

a) For wood railings, the rails and posts must be of at least 2×4-inch stock with posts spaced not more than 6 feet apart.

b) For pipe railings, rails and posts must be at least 1½-inch outside diameter pipe with posts spaced not more than 8 feet apart.

c) For structural steel rails, posts and rails must be of 2×2×⅜-inch angles or other metal shapes of equivalent strength with posts spaced not more than 8 feet apart.

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

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

Fixed Industrial Stairs

1. Riser height and tread width must be uniform throughout any flight of stairs.
2. All treads must be reasonably slip resistant.
3. Vertical clearance above any stair tread to any overhead obstruction must be at least 7 feet, measured from the leading edge of the tread.
4. 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.
5. The angle to the horizontal made by the stairs must be between 30° and 50°.
6. All stairs should be adequately lighted.
7. If the tread is less than 9 inches wide, the risers should be open.

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

   a) A stair railing is required on each open side.

   b) 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.

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

   d) If the stairway is greater than 88 inches wide, an intermediate stair railing located midway is required.

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

Portable Ladders

1. Portable ladders must be maintained in good condition at all times with tight joints, securely attached hardware and fittings, and freely operating moveable parts. They should be kept coated with a suitable protective material.
2. They 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.
3. Ladders should be stored where they will not be exposed to the elements; wood ladders should be stored where there is good ventilation.
4. Metal ladders must not be used near energized electrical equipment.
5. 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

1. Fixed ladders must be designed to withstand a single concentrated load of at least 200 pounds.
2. Rungs of metal ladders must have a minimum diameter

of ¾ inch. Rungs of wood ladders must have a minimum diameter of 1⅛ inches.

3. Rungs must be at least 16 inches wide, be spaced no more than 12 inches apart, and be free of splinters and burrs.
4. Ladders, when their location so demands, must be painted or treated with a preservative to resist deterioration.
5. The preferred pitch for safe descent is 70° to 90° unless caged, ladders with 90° pitch must have a 2½-foot clearance on the climbing side. There must be a 3-foot clearance on ladders with a 75° pitch.
6. There must be at least a 7-inch clearance in back of the ladder to provide adequate toe space.
7. Ladders must have cages if they are longer than 20 feet.
8. 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.
9. Side rails must extend at least 3½ feet above landings.

EXITS AND EXIT MARKINGS

Size and Placement of Signs

1. 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 ¾ inch wide.
2. The visibility of the sign must not be impaired by decoration, furnishings, or other signs.
3. 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."
4. 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.
5. 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.

General Requirements

1. The exit route must lead to a public way.
2. Areas around exit doors and passageways leading to and from the exit must be kept free of obstructions.
3. 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).
4. 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 it is an exit from an area of high hazard potential.
5. No lock or fastening may be used which prevents escape from inside the building.
6. There must be at least two means of exit remote from each other where occupants may be endangered by the blocking of any single exit due to fire or smoke.

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL

In metal furniture and mattress manufacturing companies, employees may be exposed to several potentially toxic substances. The most common exposures are to the following:

Paints

Paints consist of pigments, binders, thinners, wetting agents, and driers. The constituents of the paint will vary widely, and the composition depends on the use of the paint and the color. In metal furniture manufacturing, metal parts are usually spray painted with water-base enamels. The more toxic pigments, such as lead or chromium, are not normally used, but all inorganic pigments should be considered as potentially toxic and proper control measures should be used during spray painting operations. Spray painting should be done in spray booths meeting the requirements stated on page 23. Approved respirators should also be used, depending on the extent of the operation.

Organic Solvents

Organic solvents find wide application in the paint industry, as well as being used as degreasing agents for metal parts. All organic solvents have some effect on the central nervous system and the skin. The principal modes of exposure are inhalation of vapor and skin contact. Excessive solvent vapor inhalation may cause impairments which have no discernible permanent effects on health, such as lack of coordination and drowsiness, but which may increase the risk of accidents. In other cases, exposure may result in serious damage to the blood, lungs, liver, kidneys, and gastrointestinal tract.

Skin contact with solvents may cause dermatitis, ranging in severity from simple irritation to actual damage to the skin. Even the mildest solvents can dissolve the natural protective barriers of fats and oils, leaving the skin unprotected and subject to disabling dermatitis and opening the way to serious infection. (Material Safety Data Sheets provided by the manufacturer can be a good source of information in ascertaining hazardous properties of a material.)

Measures to control industrial exposures to solvents include the substitution of a less toxic solvent, mechanical local exhaust ventilation, and the use of protective clothing.

Cotton Dust

In larger mattress manufacturing companies, operations where cotton is processed into filling material are common. Special machinery, such as cotton pickers and garnetting machines, can generate cotton dust which becomes airborne.

Cotton dust has been implicated in several health conditions which affect the lungs. There is evidence that cotton textile mill workers have a higher incidence of chronic bronchitis than the normal population. Also, periodic outbreaks of an acute respiratory illness termed "weaver's cough" have occurred among weavers. The most marked effect among workers is byssinosis. This condition results in workers experiencing chest tightness when reporting to work in the beginning of the week following an absence of two or more days. Continued exposure to cotton dust may result in further complications of the cardio-respiratory system.

Control measures should focus on local exhaust ventilation and air cleaning systems. Cleaning machinery by compressed air or dry sweeping should be avoided and vacuum cleaning substituted whenever possible. Approved respirators should be provided for workers for use when dust concentrations rise above safe levels, such as when "blowing down" or when dry sweeping can't be avoided.

Chromic Acid

If automated metal cleaning systems are used to prepare metal parts for painting, often one of the stages in the system is a chromic acid bath. You should educate all employees who work with chromic acid about the hazards of the substance and the necessary protective measures.

Exposure to chromic acid may cause a skin dermititis, and a condition known as "chrome holes" (skin ulcers, most commonly found on hands at the base of the nails and over the knuckles). Additionally, airborne chromic acid mist causes inflammation of the eyes, chest pains, and attacks the nasal membranes. With excessive exposure, perforation of the nasal septum can result.

Chromic acid should be controlled at the source of dispersion by means of effective methods, such as full enclosure, local exhaust ventilation, and/or the use of surface agents which reduce mist formation. Emergency shower, hand washing, and eye washing facilities must be provided in the work area.

OCCUPATIONAL NOISE EXPOSURE

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

A noise survey by adequately equipped and trained personnel should be made before engineering and administrative controls are implemented or a hearing conservation program is established.

Administrative controls, designed to limit exposure time, 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, effective hearing protection is required.

There are many forms and types of ear protection that can be used, 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 also necessary to provide protection that is effective and yet reasonably comfortable to the wearer.

Audiometer testing should be done on an annual basis for all employees exposed to 85-90 dBA noise levels for 8 hours daily.

The following table is provided to assist in the evaluation of the noise levels in the workplace. If referral to the table indicates that levels and time of exposure are such that corrective action is needed, it is recommended that professional help be sought to correct the problem.

PERMISSIBLE NOISE EXPOSURES

NOISE SOURCES	SOUND LEVEL dBA	MAXIMUM SINGLE EXPOSURE* PER DAY dBA	INDICATORS OF LEVEL (SPEAKING EFFORT REQUIRED BETWEEN TWO PERSONS AT VARIOUS DISTANCES)
PNEUMATIC CHIPPER (AT 5 FT.)	115	15 MIN.	NEARLY IMPOSSIBLE TO COMMUNICATE BY VOICE
ELECTRIC ARC CUTTING	110	30 MIN.	VERY DIFFICULT TO COMMUNICATE BY VOICE
PNEUMATIC AIR HOIST	105	1 HOUR	SHOUT WITH HANDS CUPPED BETWEEN MOUTH AND OTHER PERSON'S EAR
	102	1.5 HOURS	
	100	2 HOURS	SHOUT AT 0.5 FOOT
	97	3 HOURS	
	95	4 HOURS	SHOUT AT 1 FOOT
VANEAXIAL VENTILATING FOR (1500 cfm)	92	6 HOURS	NORMAL VOICE AT 0.5 FOOT RAISED VOICE AT 1 FOOT
BOILER ROOM	90	8 HOURS	SHOUT AT 2 FEET
			TELEPHONE USE IMPOSSIBLE
DIESEL TRUCK (40 MPH AT 50 FT.) TORCH CUTTING			NORMAL VOICE AT 1 FOOT RAISED VOICE AT 2 FEET SHOUT AT 4 FEET
	80		NORMAL VOICE AT 1.5 FEET RAISED VOICE AT 3 FEET SHOUT AT 6 FEET
	75		NORMAL VOICE AT 2 FEET RAISED VOICE AT 4 FEET SHOUT AT 8 FEET

*Exposure for remainder of day must be less than 90 dBA

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 level is 100 dBA, the permissible exposure time is 2 hours.) Reference to the preceding table gives estimates of noise levels and the maximum allowable exposure times.

At greater than 90 dBA exposure (8 hours per day), or for higher noise levels in excess of the allowable time, a continuing, effective hearing conservation program must be implemented so as to reduce noise levels or the exposure times to comply with the standard. An established hearing conservation program would include:

1. periodic noise measurements;
2. engineering/administrative controls;
3. personal hearing protection;
4. audiometric testing.

The thrust of the hearing conservation program should be the development of engineering controls to reduce noise exposure. Engineering controls would include:

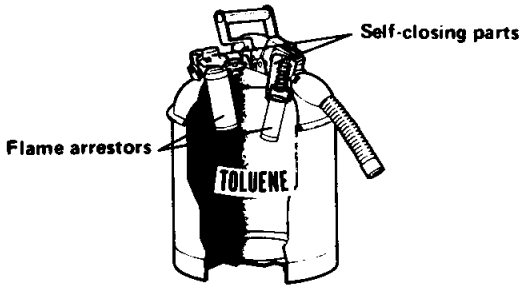
1. enclosing the noisy equipment,
2. accoustical treatment of walls to reduce noise reflection,
3. vibration dampening of noisy machines, and
4. replacement of metal to metal contact with synthetic material to metal contact.

HAZARDOUS MATERIALS

Flammable and Combustible Liquids

The category of flammable and combustible liquids is determined 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.

1. Connections on all drums and piped systems of flammable and combustible liquids must be vapor- and liquid-tight.
2. When flammable liquids are transferred from one container to another (e.g., from a bulk container to a portable container), the containers must be effectively bonded and grounded. This practice prevents electrical discharge (i.e., sparks) from the accumulation of static charge because of the transfer process.
3. 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.
4. 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.



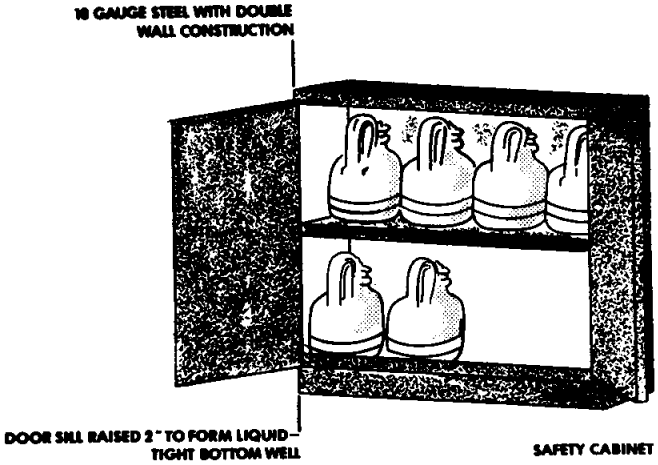
An approved safety container

5. All flammable liquids must be kept in closed containers when not in use.
6. Combustible waste material, such as oily shop rags and paint rags, must be stored in covered metal containers and be disposed of daily.
7. 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 1½-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.



An approved metal storage cabinet

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

Inside Storage Areas

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 (12B minimum) and 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.

LP Storage Area

1. "NO SMOKING" sign MUST be present on the storage tank.
2. Units being fueled MUST be turned off while filling.
3. The LP tank MUST be guarded to protect it from vehicular damage.
4. Electrical connections, pumps, and switches MUST be vapor- and explosion-proof.

SPRAY PAINTING

General Spray Operations

1. Portable lamps must be removed during spraying.
2. Low flash point thinners (less than 100°F) may be used for cleaning purposes only in a well ventilated area, such as a spray booth.
3. The fire control sprinkler heads must be kept clean and free of overspray.
4. "NO SMOKING" signs must be posted wherever flammable liquids are sprayed or stored.

Spray Areas

1. Spray areas must be at least 20 feet from flames, sparks, non-explosion-proof electric motors or other ignition sources.
2. Spray areas must be free from hot surfaces, such as heat lamps.

3. Electric lights in a spray area must be covered and guarded from accidental breakage.
4. Spray areas must be kept clean and free of combustible residue.
5. Mechanical ventilation must be provided and used to remove vapors during spraying operations. Fumes and vapors must not be drawn through the breathing zone of the operator.

Spray Booths

1. Spray booths must be made of metal, masonry, or other suitable, noncombustible material and be smooth on the inside to aid in cleaning.
2. The floors and baffles must be noncombustible and easily cleaned.
3. Spray booth lights must be explosion-proof or enclosed in sealed panels.
4. Mechanical ventilation must be operated during spraying. The ventilation rate must be at least 100 linear feet per minute (average air velocity over the open face of the booth). (60 linear feet per minute for electrostatic spraying operations.)

Electric motors for the exhaust fans must be placed 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 work area.

5. Air supply for spray booths:
   a. Overspray filters must have pressure gauges to indicate when the filters are clogged and need replacement.
   b. When temperatures are below 55°F, the make-up air must be heated to at least 65°. The heater for the make-up air must be located outside the spray booth.
6. Paint drying apparatus:
   a. Mechanical ventilation must be left on while paint is drying. A warning sign to this effect must be attached to the drying apparatus.
   b. Spray areas used for drying, where portable heaters or lights are used, must be kept clean of overspray.

The heaters or lights must be removed before spraying again in the area.

c. Electrically operated drying apparatus must be properly grounded.

7. There must never be a supply of flammable and combustible liquids in the vicinity of spray operations greater than the amount needed for one day or one shift.

PERSONAL PROTECTIVE EQUIPMENT

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 protective devices.

All personal protective equipment must be of safe design and construction for the work to be performed and maintained in a sanitary and reliable condition.

Eye and Face Protection

Eye protection or face shields are required where there is a possibility of any eye injury from flying particles, chips, and splashes from liquids such as acids, solvents, or hot or molten metals. Employees must wear this equipment when using grinders, power drills, pneumatic chisels, etc.

Eye and face guards 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 capable of being disinfected. If it is worn by persons whose vision requires corrective lenses, goggles must be capable of being worn over glasses, or constructed so that the corrective lenses can be mounted behind the protective lenses.

Head Protection

Hard hats conforming to specifications established by the American National Standards Institute (289.1-1969) are required in a situation where workers may be subjected to impact or penetration from falling or flying objects.

Gloves

When handling hazardous liquids, resins, acids, or other hazardous materials, employees must wear gloves which are impervious to such materials. The gloves must be long enough to protect the forearms. Gloves should be inspected periodically for pinholes and material integrity. The following table suggests glove types for exposure to the listed substances (a decision regarding the use of a specific glove type should be made in consultation with the supplier):

Chemical	Neoprene	Natural rubber or latex	Polyvinyl Alcohol	Buna-N	Poly-D (polyethylene)	Vinyl Tru-Touch
Animal Oils	E	F	E	E	E	G
Degreasing Fluids	F	P	E	G	E	P
Epoxy Resins, Dry	E	E	E	E	E	E
Chromic Acid	F	P	P	F	G	G
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	G
Isopropyl Alcohol	E	E	F	E	E	G
Lacquer Thinners	G	F	E	G	F	F
Mercury	G	G	P	P	E	F
Nitric Acid	G	F	NR	F	F	F
Paint Thinners	G	F	E	G	G	F
Petroleum Spirits	E	F	E	E	G	P
Phosphoric Acid	E	G	P	E	E	G
Potassium Hydroxide	E	E	P	E	E	G
Sodium Hydroxide	E	E	P	E	E	G
Stoddard Solvent	E	F	E	E	G	F
Sulphuric Acid	G	G	P	G	F	F
Toluol	F	P	E	E	G	P
Trichlorethylene	F	P	E	F	G	P
Xylol	P	P	E	E	G	P

KEY: E—Excellent; G—Good; F—Fair; P—Poor; NR—Not Recommended.

Foot Protection

Foot protection is required to prevent injury from falling objects. Particularly in receiving and transferring inventory, experience has shown that precautions are needed against falling items. In areas which may be slippery (e.g., battery charging and acid areas), appropriate footwear (e.g., rubber boots, etc.) which provide good traction shall be provided.

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, etc.), coveralls, caps, and other types of clothing (e.g., rubber suits, etc.) may be necessary for a complete change of outer work clothes. This type of clothing should be discarded in appropriate hampers and the employee should change to street clothes after a shower, if necessary. It may also be necessary for the company to have a separate laundry facility or have the clothing sent to a commercial laundry.

Respiratory Protection

NIOSH-approved respirators 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 in the process of being implemented, use of respirators is permitted.

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

1. Respirators must be selected which are designed to protect against the specific hazards to which the worker is exposed.
2. Written instructions covering selection and use of respirators must be available.

Working with an approved respirator

3. Employees must be trained in the use of respirators, their limitation, proper fitting, and maintenance.
4. Respirators should be cleaned at the end of each day's use. They are taken apart, washed, dried, and defective parts replaced.
5. Two people never wear the same respirator unless it has been cleaned and disinfected between use.
6. All straps are tied and adjusted.
7. A good face seal is necessary—beards, sideburns, or glasses may interfere.
8. Filters are 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.

FIRE PROTECTION

Good Housekeeping Helps Prevent Fires

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

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

Some common causes of fires in all businesses are:

- electrical malfunctions
- friction
- open flames
- sparks
- hot surfaces
- smoking

Proper maintenance and periodic inspections of the facility through a safety program can reduce these hazards.

Scheduled maintenance checks of electrical machinery and ventilation systems, proper storage and disposal of combustible sweeping compounds, oily mops and rags, flammable solvents, good housekeeping, and periodic facility inspection rank as the best safeguards against fire. However, even the best maintained facility can have a fire.

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

Fire Alarm System

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

1. Detection System
   The fire alarm system must include detection devices, each designed for the area it is to protect. Typical de-

tection devices are smoke detectors, flame detectors, and heat detectors. Decision regarding the type of detector to use should be made in consultation with the local fire department.

2. 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 the local fire department is advised.

3. Warning System
   The warning system should include warning bells or buzzers 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.

1. *Building Evacuation*
   A plan for orderly evacuation should include the following:
   a. an evacuation signal.
   b. a well-planned evacuation route for employees in *all* areas of the facility.
   c. designation of a re-assembly area for personnel—well away from the plant.
   d. an accounting procedure for personnel after re-assembly. A daily list of plant personnel on travel or absent should be maintained to facilitate accounting.
   e. 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.

2. *Notification and Training*
   a. a list of telephone numbers for local fire departments should be posted in prominent places throughout the plant — and all employees advised of this posting.
   b. floor plans for designated plant areas should be posted showing locations of fire alarm activators, fire extinguishers, and exits.
   c. several employees in each area of the facility should be trained in the use of fire extinguishers.

Fire Extinguishers

Fire extinguishers must:

1. Be kept fully charged and in their designated places.
2. Be located along normal paths of travel.
3. Not be obstructed or obscured from view.
4. Not be mounted higher than 5 feet (to the top of the extinguisher) if 40 pounds or less. If heavier than 40 pounds, they must not be mounted higher than 3½ feet.
5. Be inspected by management or a 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.
6. Be examined at least yearly and recharged or replaced, if necessary, to insure operability and safety. A tag must be attached to show the maintenance or recharge date and signature or initials of the person performing the service.
7. Be hydrostatically tested. Extinguisher sales representatives usually will perform this service at appropriate intervals.
8. Be selected on the basis of type of hazard, degree of hazard, and area to be protected.

9. 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 Std.)

The following are salient points of these requirements:

1. Every automatic sprinkler system must have at least one automatic water supply of adequate pressure, capacity, and reliability.
2. One or more fire department connections through which the fire department can pump water is required. No shut-off valve is allowed in this connection.
3. 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.
4. 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.
5. 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 "OSHA Standards" 1910.159.

GENERAL ENVIRONMENTAL CONTROLS

Sanitation

1. Safe drinking water must be provided in all places of employment. The use of a common drinking cup is forbidden.
2. Receptacles for waste food are to be covered and kept in a clean and sanitary condition.
3. Restrooms are to be kept in a clean and sanitary condition, including covered containers for sanitary napkins.
4. Separate toilet facilities must be provided for each sex. The exception to this is if only one person at a time uses a toilet room and the door can be locked from the inside.
5. One toilet and one lavatory must be provided for approximately every 15 employees.
6. Each lavatory must have hot and cold or tepid running water, hand soap, individual hand towels, or warm air blowers.
7. Beverages or food must not be stored or consumed in a toilet room or in an area exposed to toxic materials.
8. Employees working with toxic substances should wash and remove contaminated clothing before eating, drinking, or smoking.

MEDICAL AND FIRST AID

An integral part of the company safety and health activity is an established medical and/or first aid program. This program can aid in preventing lost work time and in achieving good morale among the employees. Medical personnel must be readily available by phone or on-site for advice and consultation on employee health matters. A good policy is the requirement of a pre-employment medical examination to insure that prospective employees are physically able to do the specific work, and to determine if employees have some medical abnormality which could be aggravated by the assigned work. Periodic health evaluations, particularly for hazardous jobs involving employee exposure to well-documented toxic substances, should be considered.

To facilitate contact with medical personnel and/or clinic, 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 for prompt transportation of injured or ill employees to a hospital.

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

1. At least one and preferably more employees on each shift must be adequately trained to render first aid. The American Red Cross, the U.S. Bureau of Mines, some insurance carriers, local safety councils, and others with OSHA-approved programs provide acceptable training.
2. 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.
3. Suitable facilities for quick drenching or flushing of 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 treatment by a physician begins.

NOTE: First aid is immediate, temporary treatment given in the event of accident or illness—before the doctor arrives. Immediate first aid (within 4 minutes) may be the difference between complete recovery, permanent impairment, or death.

COMPRESSED AIR EQUIPMENT

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

1. 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.
2. The drain valve on the air tank should be opened frequently to prevent excessive accumulation of liquid.
3. Air tanks must be protected by adequate safety-relief valve(s). These valves must be tested at regular intervals to be sure they are in good operating condition.
4. The pressure controller and gauge must be maintained in good operating condition.
5. There must be no valves between the air tank and 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 resultant 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 maintained throughout the storage area.

Hydraulic Lift Trucks and Hand Trucks

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

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

Powered Industrial Trucks

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

1. High-lift rider trucks must be fitted with an overhead guard to protect the operator from falling objects.
2. Methods must be developed and used to effectively train operators in the safe operation of powered industrial trucks, and only trained and authorized employees may operate the truck. Truck manufacturers and suppliers may provide training courses.
3. 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.
4. 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.
5. If the load being carried obstructs forward view, the operator is required to travel with the load trailing.
6. 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.

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

Hoists

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

1. The rated load limit must be legibly marked on each side of the hoist. Employees should be made aware of the weight of the loads to be carried.
2. The hoist must be equipped with a self-setting brake applied to the motor shaft or some part of the gear train.
3. For powered hoists, holding brakes must be applied automatically when the power is off.
4. Hooks, chains, and all functional operating mechanisms must be visually inspected daily for any indication of damage and wear, and monthly inspection records must be maintained.
5. Loads must not be carried over the heads of people.
6. The operator must test the brakes each time a near-capacity load is handled. This test is done by raising the load a few inches and applying the brakes.
7. The hoist rope or chain must be free from kinks or twists and must not be wrapped around the load.

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 (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:

1. Only personnel designated as qualified by the employer shall be permitted to operate cranes.
2. The rated load limit of the crane must be plainly marked on each side of the crane, and be clearly legible to the operator.
3. Employees should be made aware of the weight of the load.
4. Hooks, ropes, chains, brakes, and all functional operating mechanisms must be inspected daily for indications of damage and excessive wear.
5. Written and signed inspection reports must be made monthly on critical items such as brakes, hooks, and ropes, and be readily available.
6. Hand signals to operators should be those prescribed by the applicable ANSI standard for the type of crane in use.
7. The hoist chain or rope must be free from kinks or twists and must not be wrapped around the load.
8. Hoisting, lowering, swinging, or traveling is not permitted while anyone is on the load or hook.
9. Loads must not be carried over the heads of people.
10. The operator must test the brakes each time a near capacity load is handled, by raising it a few inches and applying the brakes.
11. The operator must not leave his position at the controls while the load is suspended.
12. 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.
13. When making a hook up, the hook must be centered over the load to prevent swinging.
14. The trip-setting of hoist limit switches must be determined by tests with an empty hook.

Overhead and Gantry Cranes—

OSHA requirements also include:

1. 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.
2. 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.
3. If a 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.
4. A carbon dioxide, dry-chemical, or equivalent hand fire extinguisher should be kept in the cab.
5. 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:

1. Slings that are damaged or defective must not be used.
2. Slings must not be shortened with knots, bolts, or other makeshift devices.
3. Sling legs must not be kinked.
4. Slings must be securely attached to their loads and must not be loaded in excess of their rated capacities.

5. Slings must be padded or protected from the sharp edges of their loads.
6. 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.
7. Shock loading is prohibited.
8. A sling must not be pulled from under a load while the load is resting on the sling.

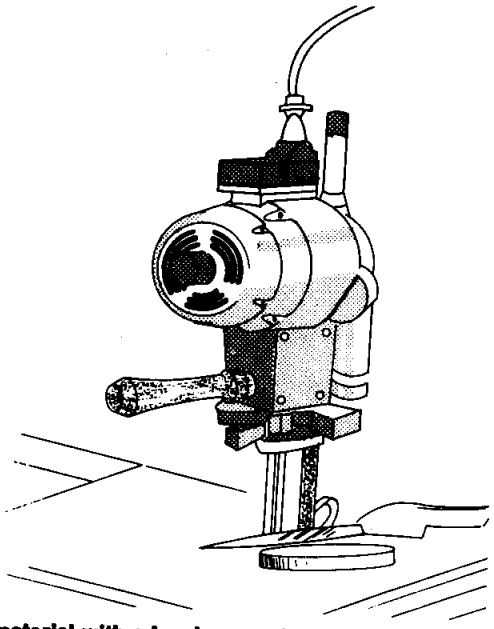
MACHINERY AND MACHINE GUARDING

General Requirements for Machine Guarding

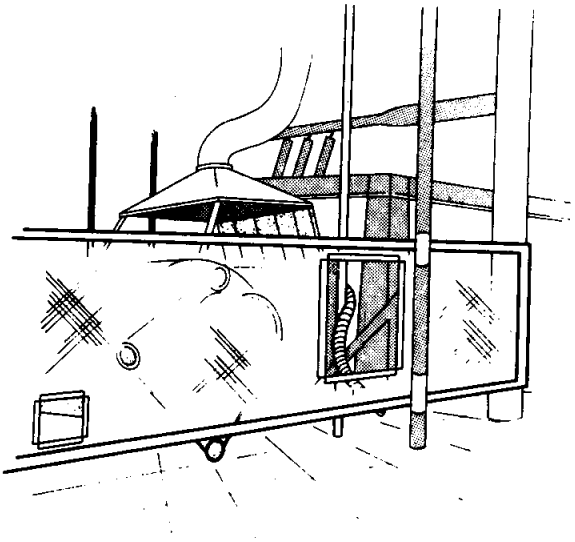
One or more methods of machine guarding must be provided to protect the operator and other employees in the machine area from hazards such as those created by the point of operation, in-running nip points, rotating parts, flying chips, and sparks. All such hazards located 7 feet or less above the ground, floor, or working platform must be guarded to prevent accidental contact. Guards must be attached to the machine, if possible, or secured elsewhere if attachment to the machine is not possible. The guard must 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:

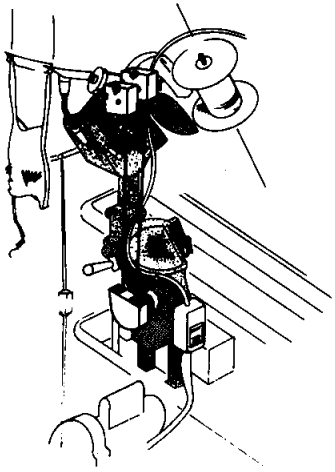
- enclosing the operation (the preferred method)
- interlocking devices
- two-hand tripping devices
- electronic safety devices



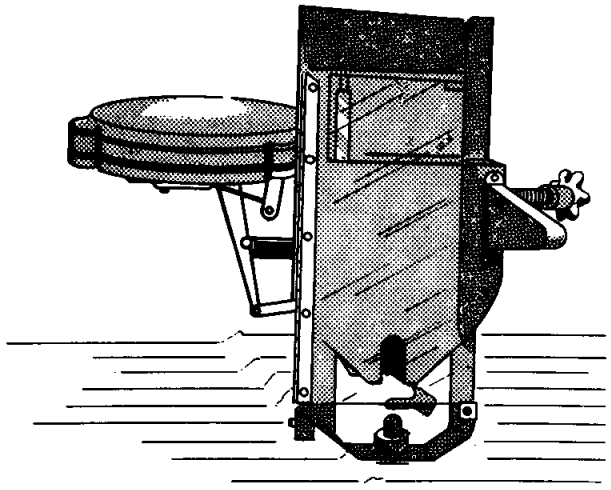
Power knife for material with a barrier guard



Garnett machine with area barrier guard



Closing machines with enclosure guards around belts and pulleys



Mattress tufting machine with transparent barrier guard at point of operation

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 could 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.

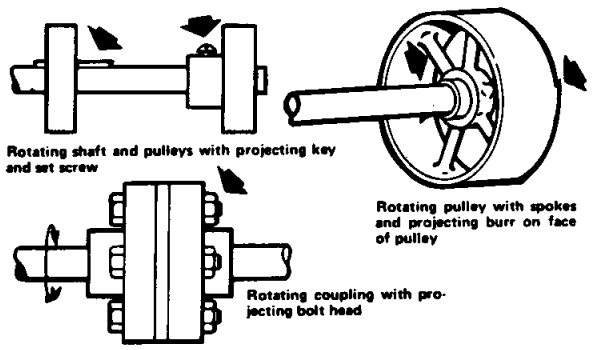
Common types of automatic guards are sweep and push-away devices which create a moving barrier across the danger zone and push the operator's hand away from the area. Certain guarding methods are preferable to others. The type of operation, the size and shape of stock, the method of handling stock, the physical layout, the type of material, and the production requirements or limitations are important considerations.

Some typical machining and process actions that 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.

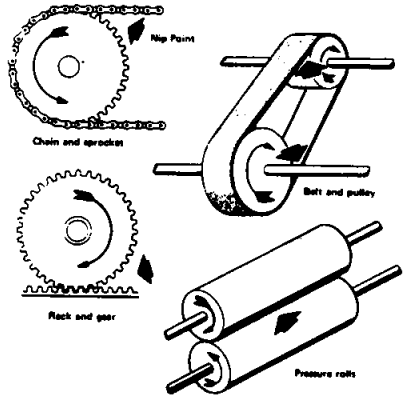
ROTATING PARTS



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.

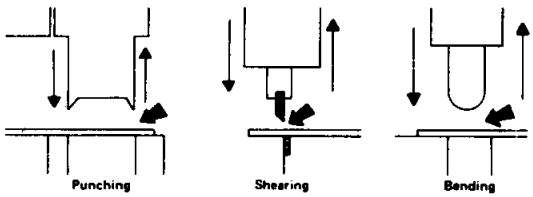
IN-RUNNING NIP POINTS



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.

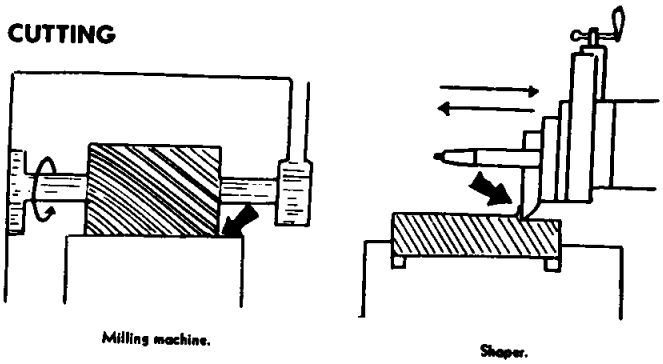
PUNCHING, SHEARING, AND BENDING



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

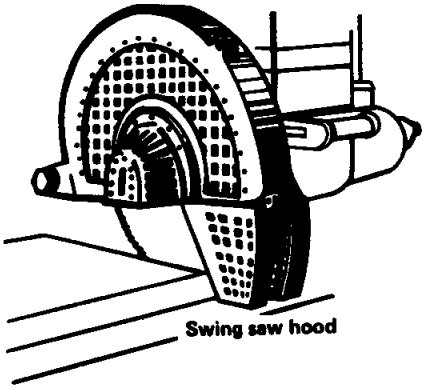
Cutting Actions

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.

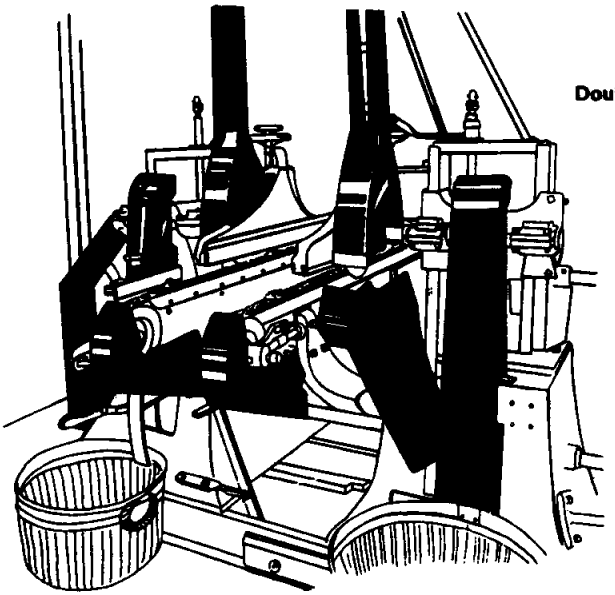


Typical examples of cutting action are band and circular saws, milling machines, planing or shaping machines, turning machines, boring or drilling machines, and grinding machines.

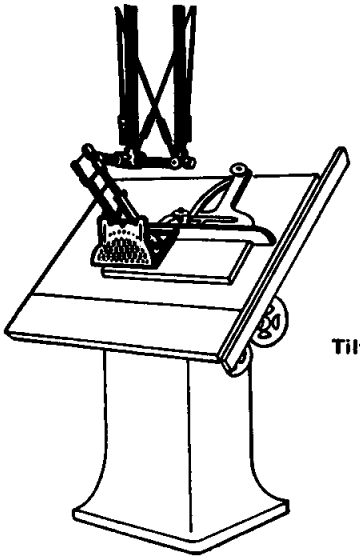
Mattress boxsprings have wooden bases and, if the bases are manufactured in the plant, a woodshop area is needed. Wood working machinery must be properly guarded. Some examples are illustrated.



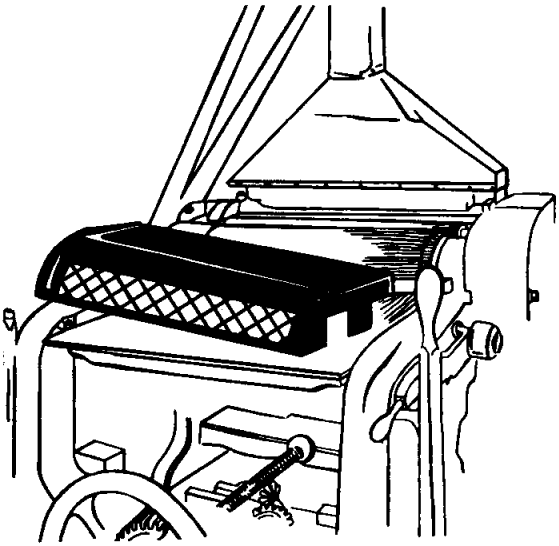
Swing saw hood



Double End Tenoner



Tilting table saw guard



Planer. Guard for feed rolls removed showing substantial construction.

Guarding Cutting Actions—

The hazard during cutting operations lies at the point where the cutting takes place. In many cases, a choice of guarding methods is available.

Circular saws must be provided with 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, material being cut. A spreader should be provided. The exposed part of the saw underneath the table must be guarded.

Radial saw. In addition to a hood enclosing the blade, an adjustable stop must be provided to limit forward travel and the head must automatically return to the starting position. When used for ripping, an anti-kickback device must be provided.

Swing saw. In addition to the hood enclosing the blade, the swing saw should be provided with a limit chain or other device to limit forward travel and a device to automatically return the head to starting position. Hood should enclose saw.

Grinders

Requirements:

1. Wheel Guard—Safety guards must cover the spindle end, nut, and flange projections.

   The exposed area of the grinding wheel and sides for the safety guards should not exceed more than one-fourth of the entire wheel.

   When measuring the guard opening, the visors or other accessory equipment are not included as a part of the guard unless this accessory equipment is as strong as the guard.

2. Work or Tool Rests—These rests must be of strong construction and designed to be adjustable to compensate for wheel wear. Work rests must be closely adjusted to the

wheel, with a maximum clearance of ⅛ inch, to prevent the work from becoming jammed between the wheel and the work rest.

3. Exposure Adjustment or Tongue Guards—This safety guard must be constructed so that the tongue guard can be adjusted to the constantly decreasing diameter of the wheel. The distance between the tongue guard and the wheel must never be more than ¼ inch.
4. Goggles or a Face Shield—These must be worn by the operator.

Fans

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

Air Compressors

Air compressors must have their flywheel and drive pulley fully enclosed.

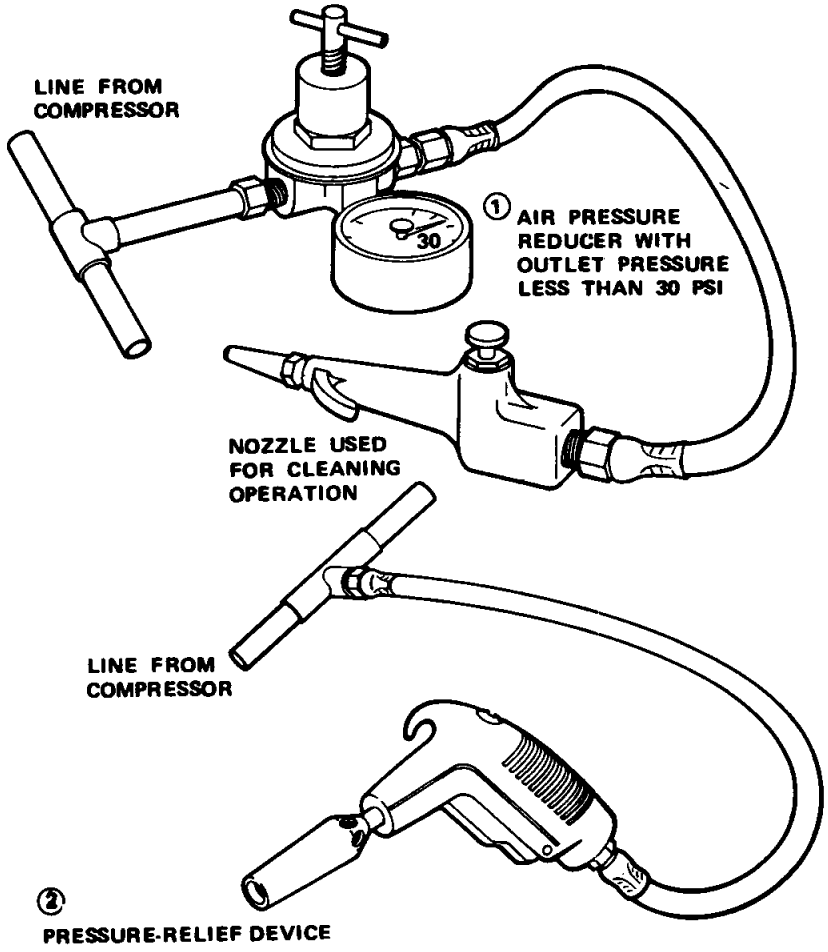
HAND AND PORTABLE POWERED TOOLS

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

1. 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.*
2. Hammers with broken or cracked handles, chisels and punches with mushroomed heads, or bent or broken wrenches should not be used.
3. Most hand-held powered tools must be equipped with a dead-man control so that the power is automatically shut off whenever the operator releases the control.
4. 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 when the tool is withdrawn from the work.
5. All hand-held portable electrical equipment must have its frame grounded or be doubly insulated and identified as such.

Beware of compressed air, it can be dangerous. Alternate methods of cleaning surfaces should be sought. Compressed air should 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 and then only when effective chip guarding and personal protective equipment are used.

Two acceptable methods of meeting the "below 30 psi" requirement are illustrated below.



WELDING, CUTTING, AND BRAZING

General

1. Management must establish areas for cutting and welding operations based on the fire potentials of the plant. Special procedures must be established for welding and cutting in high hazard locations. Preferably, cutting or welding should be done in an area with no surrounding combustible material. If combustibles in the immediate vicinity are unavoidable, guards must be used to protect against the fire hazards from heat and sparks. Suitable fire extinguishing equipment (pails of water, buckets of sand, hose, or portable extinguisher) must be maintained for instant use.
2. Torch cutters and welders must be suitably trained in the safe operation of their equipment. Printed rules and instructions (supplied by the manufacturers) covering operation of equipment must be strictly enforced.
3. 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 as to make absolutely certain that there are no flammable materials present or any substances such as greases, tars, acids, or other materials which, when subjected to heat, might produce flammable or toxic vapors.
4. The atmosphere in the welding area must be free of flammable gases, liquids, and vapors.
5. Goggles or other suitable eye protection (helmets, hand shields) must be used during welding or cutting operations as a protection against sparks and debris.
6. 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.
7. Employees exposed to hazards created by cutting and welding must be protected by personal protective equipment. For example:
    - Flameproof gauntlet gloves (except when engaged in light work) should be worn.
    - Flameproof aprons (leather, for example) may be desirable as protection against sparks and radiant heat.

- Fire resistant leggings or high boots should be worn.

8. 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.
9. There are specific requirements concerning ventilation and respirators when welding or cutting is performed on the following:
    - stainless steel, lead, zinc, or cadmium
    - metals coated with lead or mercury-containing materials such as paint, or
    - fluxes or other materials containing fluorides

Requirements for Ventilation and Respirators When Welding or Cutting

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

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

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

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

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

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

E = Approved respirators.

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

10. Mechanical ventilation must be provided when welding or cutting is done on metals not covered in the table when:
    (a) the volume of space per welder is less than 10,000 cubic feet,
    (b) the ceiling is less than 16 feet high, or
    (c) 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:

1. All cylinders must be away from radiators and other sources of heat.
2. 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.
3. Valve protection caps must be utilized where the cylinder is designed to accept a cap, except when cylinders are in use or connected for use.
4. 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 ½-hour fire resistance rating. A sheet metal partition is not an acceptable method of separating cylinders.
5. 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.

6. All cylinders must be legibly marked to identify contents.

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

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

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

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

Electric Arc Welding

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

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

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

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

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

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

6. Welding helmets or hand shields must be worn by the operator. Persons close by must wear eye protection.

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

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

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

Resistance Welding

1. Employees designated to operate resistance welding equipment must be properly instructed and competent to operate such equipment.
2. All doors and access panels of all resistance welding machines and control panels must be kept locked and interlocked to prevent access to live parts by unauthorized persons.
3. Each power circuit of resistance welding machines must have a safety-type disconnect switch or circuit breaker conveniently located at or near the machine to shut off power during servicing.
4. Capacitor discharge type of resistance welding equipment plus control panels involving high voltage (over 550 volts) must be insulated by complete enclosure, interlocks or doors to interrupt power, and a manually operated switch as an added safety measure to insure that capacitors are completely discharged.
5. All press welding machine operations, where there is a possibility of the operator's fingers being under the point of operation, must be effectively guarded.
6. All chains, gears, operating bus linkage, and belts must be protected by adequate guards.
7. All foot switches must be guarded to prevent accidental operation of the machine.

THE NATIONAL ELECTRICAL CODE (NEC)

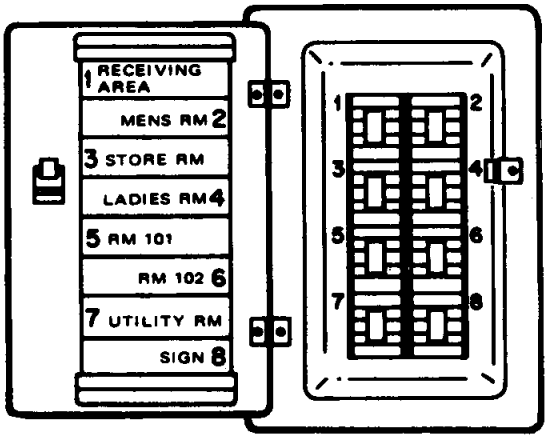
Electrical Requirements

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 (NEPA 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:

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

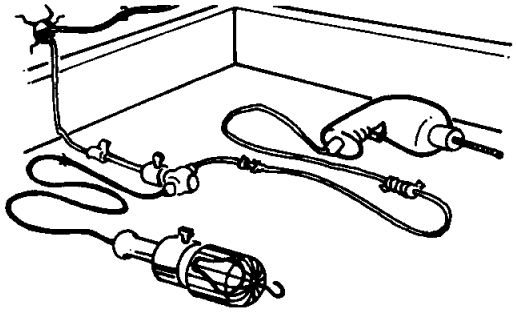


Proper labelling of circuit breakers

2. Frames of electrical motors, regardless of voltage, must be grounded.
3. 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
4. Exposed noncurrent-carrying metal parts of the following 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

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



Misuse of flexible cords

6. 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.
7. 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.
8. All splices in flexible cords must be brazed, welded, or soldered or joined with suitable splicing devices. Any splices, joints, and 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 100, 101 (or equivalent), and 102. The following cases must be recorded on the OSHA Form 100 (Log of Occupational Injuries and Illnesses): every death, every illness, and any injury which results in loss of consciousness, loss of time, restriction of work or motion, temporary or permanent transfer to another job, or medical treatment other than first aid. Illnesses and injuries are classified 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 100 and 101 must be kept current to within 6 days.

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

A booklet, "Recordkeeping Requirements Under the Williams-Steiger Occupational Safety and Health Act of 1970," 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 jobsite inspections to ensure compliance with the Act.

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

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

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

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

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

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

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

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

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

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

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

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

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

Washington, D.C.
1974
OSHA 2203

Peter J. Brennan
Secretary of Labor

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

CHECKLISTS

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

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

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

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

WALKING AND WORKING SURFACES — AISLES AND FLOORS (29 CFR 1910.22-.27)

	Yes	No
Are all places of employment kept clean and orderly?	☐	☐
Are floors, aisles, and passageways kept clean and dry?	☐	☐
Are permanent aisles appropriately marked?	☐	☐
Storage Lofts, Second Floors, Etc.		
Are signs showing floor-load capacity present?	☐	☐
Are platforms, storage lofts, balconies, etc., that are more than 4 feet above the floor protected with standard guardrails?	☐	☐

	Yes	No
Are all platforms, lofts, and balconies (above where people or machinery could be exposed to falling objects) also guarded with standard 4-inch toeboards?	☐	☐

Ladders

Have defective ladders (e.g., broken rungs, side rails, etc.) been tagged as "DANGEROUS, DO NOT USE" and removed from service for repair or destruction?	☐	☐
Is it prohibited to use the top of an ordinary step ladder as a step?	☐	☐
Do fixed ladders have at least 3½ feet of extension at the top of the landing?	☐	☐
Is the distance between the centerline of rungs on a fixed ladder and the nearest permanent object in back of the ladder at least 7 inches?	☐	☐
Do all fixed ladders have a preferred pitch of 75°-90°?	☐	☐

Stairs

Are there standard stair rails or handrails on all stairways having four or more risers?	☐	☐
Are all stairways at least 22 inches wide?	☐	☐
Do stairs have at least a 7-foot overhead clearance?	☐	☐
Do stairs angle no more than 50° and no less than 30°?	☐	☐

EGRESS (29 CFR 1910.36-.37)

Are all exits marked with an exit sign and illuminated by a reliable light source?	☐	☐
Is the lettering at least 6 inches high with the		

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

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL (29 CFR 1910.1000, .94)

Is management aware of the hazards caused by various materials in the plant (solvents, cottondust, chromic acid, etc.)?	☐	☐
Are eye wash fountains and safety showers provided in areas where corrosive chemicals are used?	☐	☐
Are all containers, such as vats, storage tanks, etc., labeled as to their contents?	☐	☐
Are employees required to wear personal protective equipment when handling hazardous materials?	☐	☐
Have occupational exposures been evaluated for dusts, vapors, and mists?	☐	☐
Is vacuuming used wherever possible rather than blowing or sweeping dust?	☐	☐

OCCUPATIONAL NOISE EXPOSURE (29 CFR 1910.95)

	Yes	No
If a noise problem is suspected, have noise levels been accurately measured? _____	☐	☐
If a noise problem exists, have plans to reduce noise levels by engineering methods been formulated (e.g., enclosure, maintenance, different methods of processing)? _____	☐	☐
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? _____	☐	☐
2. Are affected employees given annual audiometric tests, if necessary? _____	☐	☐
3. Do all employees in high-noise areas wear hearing protection? _____	☐	☐
4. Are annual noise surveys made to re-evaluate the problem? _____	☐	☐

HAZARDOUS MATERIALS FLAMMABLE AND COMBUSTIBLE LIQUIDS (29 CFR 1910.106)

Are all connections on drums and piped systems of combustible and flammable liquids vapor- and liquid-tight? _____	☐	☐
Are flammable liquids kept in closed containers when not in use (e.g., parts cleaning tanks, pans, etc.)? _____	☐	☐
Are all spills of flammable or combustible liquids cleaned up promptly? _____	☐	☐
Is combustible waste material (oily rags, etc.) stored in covered metal receptacles and disposed of daily? _____	☐	☐
Are bulk drums of flammable liquids grounded and bonded to containers during dispensing? _____	☐	☐

	Yes	No
Are gasoline and other flammable liquids stored in approved containers?	☐	☐
Do storage rooms for flammable and combustible liquids have explosion-proof lights?	☐	☐
Do storage rooms for flammable and combustible liquids have mechanical or gravity ventilation (at least six air changes per hour)?	☐	☐
Are storage cabinets for flammable and combustible liquids labeled "FLAMMABLE—KEEP FIRE AWAY"?	☐	☐

PAINT SPRAY OPERATIONS (29 CFR 1910.107)

Are portable lamps removed during spray operations?	☐	☐
Do cleaning solvents have high flash points (not less than 100°F)?	☐	☐
Are fire control sprinkler heads kept clean?	☐	☐
Are "NO SMOKING" signs posted in the spray area, paint room, paint booth, and paint storage area?	☐	☐
Are the electric motors for exhaust fans placed outside booths or ducts?	☐	☐
Are belts and pulleys inside the booth fully enclosed?	☐	☐
Do ducts have access doors to permit cleaning?	☐	☐
At low temperatures (below 55°), is make-up air heated to at least 65°?	☐	☐
Is the make-up air heater located outside the spray booth?	☐	☐
Do all drying spaces have adequate ventilation?	☐	☐

	Yes	No
Is the spray area at least 20 feet from flame, sparks, electric motors, or other ignition sources?	☐	☐
Is the spray area free of hot surfaces?	☐	☐
Is the spray area kept clean of combustible residue?	☐	☐
Are spray booths constructed of metal, masonry, or other substantial noncombustible material?	☐	☐
Are spray booth floors and baffles noncombustible and easily cleaned?	☐	☐
Do spray booths have explosion-proof lights or are they lighted through sealed clear panels?	☐	☐
Is mechanical ventilation on during spray operations?	☐	☐
Is the spray area completely ventilated before using the drying apparatus?	☐	☐
Is the electric drying apparatus properly grounded?	☐	☐

PERSONAL PROTECTIVE EQUIPMENT (29 CFR 1910.132-.137)

Is personal protective equipment provided, used, and maintained wherever it is necesary?	☐	☐
Is employee-owned personal protective equipment, such as gloves and protective footwear, adequate and properly maintained?	☐	☐
Is eye and face protection required and used to prevent injury from flying debris, sparks, or chips during grinding, welding, cutting, etc.?	☐	☐
Are hard hats and foot protection available		

	Yes	No
and used where falling objects could be a problem?	☐	☐
When engineering and/or administrative controls are not feasible, are ear plugs or muffs provided and worn during noisy conditions?	☐	☐
Are respirators provided and used when necessary?	☐	☐
Are there written standard operating procedures for the selection and use of respirators?	☐	☐
Is the user instructed and trained in the proper use of respirators?	☐	☐
Where practicable, are respirators assigned for use by employees individually?	☐	☐
Are respirators cleaned and disinfected after use?	☐	☐
Are respirators stored in a convenient, clean, and sanitary location?	☐	☐
Are routinely-used respirators inspected during cleaning?	☐	☐

GENERAL ENVIRONMENTAL CONTROLS SANITARY (29 CFR 1910.141)

Are restrooms and washrooms kept in clean and sanitary condition?	☐	☐
Are covered receptacles for sanitary napkins provided in the women's restroom?	☐	☐
Are covered receptacles for waste food kept in clean and sanitary condition?	☐	☐
Is all water that is provided for drinking, washing, and cooking, suitable for drinking?	☐	☐
Are all outlets for water that is not suitable for drinking, clearly posted as "UNSAFE FOR DRINKING, WASHING, OR COOOKING"?	☐	☐

	Yes	No
Are employees prohibited from eating in areas where toxic materials are present?	☐	☐
Has pest control been exercised?	☐	☐
If employees are permitted to eat on the premises, are they provided with a suitable space for that purpose?	☐	☐

MEDICAL AND FIRST AID (29 CFR 1910.151)

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

FIRE PROTECTION (29 CFR 1910.157)

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

	Yes	No
Class A. Ordinary combustible material fires		
Class B. Flammable-liquid, or grease fires		
Class C. Energized-electrical-equipment fires		
Are extinguishers fully charged and in their designated places?	☐	☐
Are extinguishers located along normal paths of travel?	☐	☐
Are extinguisher locations free from obstruction or blockage?	☐	☐
Are extinguishers not mounted too high? If 40 pounds or less, the top must be below 5 feet above floor; greater than 40 pounds, the top must be below 3½ feet above floor.	☐	☐
Have all extinguishers been serviced, maintained, and tagged at intervals not to exceed 1 year?	☐	☐
Are all extinguishers checked (by management or designated employee) monthly to see if they are in place or if they have been discharged, etc.?	☐	☐
Have all extinguishers been hydrostatically tested according to schedules set for the type of extinguisher?	☐	☐

COMPRESSED AIR (29 CFR 1910.169)

Are pulleys and belts on compressors and motors completely guarded?	☐	☐
Are flexible cords or plugs on electric motors periodically checked and replaced if in a deteriorated condition?	☐	☐
Do the relief valves operate properly?	☐	☐

	Yes	No
Are air tanks drained regularly?	☐	☐
Is the pressure-relief device and gauge in good operating condition?	☐	☐

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

Is there safe clearance for equipment through aisles and doors?	☐	☐
Is stored material stable and secure?	☐	☐
Are storage areas free from tripping hazards?	☐	☐
Are only trained operators allowed to operate powered lift trucks?	☐	☐
Are appropriate overhead guards installed on powered lift trucks?	☐	☐
Is battery charging on electric units performed only in designated areas?	☐	☐
Are "NO SMOKING" signs posted near electric battery charging units?	☐	☐
Are dock boards (bridge plates) used when loading or unloading from dock to truck or dock to rail car?	☐	☐
Are racks and platforms only loaded within the limits of their capacity?	☐	☐
Is all storage secured against sliding or collapsing?	☐	☐
Are all vehicles shut off prior to loading?	☐	☐
Have aisles been designated and kept clear to allow unhindered passage?	☐	☐
If motorized equipment, such as a lift truck, is used, are aisles permanently marked, providing sufficient clearance for passage of the equipment?	☐	☐

	Yes	No
Are motorized vehicles and mechanized equipment inspected daily or prior to use?	☐	☐
Are chain hoists, ropes, and slings adequate for the load?	☐	☐
Are slings inspected daily before use?	☐	☐
Are all new, repaired, or reconditioned alloy steel chain slings proof tested before use?	☐	☐

CRANES (29 CFR 1910.179)

Are only designated, qualified employees permitted to operate cranes?	☐	☐
Is the rated load of each crane plainly marked? Are loads never carried over the heads of people?	☐	☐
Does the operator test the brakes each time a near capacity load is handled?	☐	☐
Is a fire extinguisher kept in the cab or vicinity of the crane?	☐	☐
Are hooks, ropes, brakes, and all functional operating mechanisms inspected daily for indication of damage and wear, and written monthly records signed and dated?	☐	☐
Is the hoist rope never wrapped around the load?	☐	☐
Are precautions observed which forbid anyone from riding on the crane hook or load during hoisting, lowering, or traveling operations?	☐	☐

MACHINERY AND MACHINE GUARDING (29 CFR 1910.212-.215)

Are belts, pulleys, and rotating shafts properly guarded?	☐	☐

	Yes	No
Are chains, sprockets, and gears properly guarded?	☐	☐
Are all in-going nip points properly guarded?	☐	☐
Are rotating shafts that are not smooth properly guarded?	☐	☐
Are garnett lickerins or fancy rolls enclosed?	☐	☐
Are all rotating parts (lubrication fittings, etc.) recessed or covered with collars?	☐	☐
Are all pieces of equipment with an electric motor or any electrical connection effectively grounded?	☐	☐
Are sprockets and V-belt drives within reach of platforms and passageways or less than 7 feet from the floor completely enclosed?	☐	☐
Are fans less than 7 feet above floor guarded, having openings ½ inch or less?	☐	☐

Abrasive Wheel Machinery (Grinders)

Is the work rest used and kept adjusted to within ⅛ inch of wheel?	☐	☐
Is the adjustable tongue on top side of grinder used and kept adjusted to within ¼ inch of wheel?	☐	☐
Do side guards cover the spindle, nut, and flange and 75% of the wheel diameter?	☐	☐
Are bench and pedestal grinders permanently mounted?	☐	☐
Are goggles or face shields always worn when grinding?	☐	☐
Is the top half of the wheel on swing frame grinders enclosed (maximum wheel exposure of 180°)?	☐	☐

Woodworking Equipment

	Yes	No
Are there proper guards on all saws?	☐	☐
Is the lower portion of the blade on radial arm saws guarded?	☐	☐
Are there devices used to automatically return the swing saw or radial saw back to its original position?	☐	☐
Are saws used for ripping equipped with anti-kickback dogs?	☐	☐
Does every machine have a master switch to keep it inoperative during repairs or adjustments?	☐	☐

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

Are tools and equipment (both company and employee-owned) in good condition?	☐	☐
Have mushroomed heads on chisels, punches, etc., been reconditioned or replaced if necessary?	☐	☐
Have broken hammer handles been replaced?	☐	☐
Have worn or bent wrenches been replaced?	☐	☐
Has compressed air used for cleaning been reduced to 30 psi when dead ended?	☐	☐
Have employees been instructed that the use of compressed air to blow debris from clothing or body is prohibited because it can enter the body and cause serious harm?	☐	☐
Have deteriorated air hoses been replaced?	☐	☐
Are portable abrasive wheels appropriately guarded?	☐	☐

	Yes	No
Have employees been made aware of the hazards caused by faulty or improperly used hand tools?	☐	☐
Are tool retainers used on pneumatic power tools to prevent the attachment from being expelled?	☐	☐

WELDING, CUTTING, AND BRAZING (29 CFR 1910.252)

Is proper eye protection worn by welders and adjacent workers exposed to flash?	☐	☐
Is eye protection (goggles, helmets, hand shields) provided and worn as a protection against sparks or other debris?	☐	☐
Is appropriate protective clothing (gloves, aprons, leggings, etc.) worn as a protection against sparks and other debris?	☐	☐
Is suitable fire extinguishing equipment available?	☐	☐
Are employee exposures to cutting and welding fumes kept within acceptable limits?	☐	☐
Is general or local exhaust ventilation provided when required?		
Are approved respirators used when required?	☐	☐
Is local exhaust ventilation (hoods or booths) used when performing torchwork on:		
a. lead?	☐	☐
b. zinc?	☐	☐
Whenever cutting or welding on beryllium and when toxic exposures to workers may occur, are local exhaust ventilation and NIOSH-approved supplied-air respirators provided?	☐	☐

	Yes	No
With respect to other metals (copper, iron, chrome, nickel, etc.), are mechanical ventilation or supplied-air respirators provided when cutting:		
a. in a space of less than 10,000 cubic feet per worker?	☐	☐
b. in a room having a ceiling height less than 16 feet?	☐	☐
c. in confined spaces?	☐	☐
d. in any location where employees are exposed to toxic levels?	☐	☐
Are fuel gas cylinders and oxygen cylinders in storage separated by 20 feet or a barrier 5 feet high having a ½-hour fire resistance rating?	☐	☐
Are cylinders secured and stored where they cannot be knocked over?	☐	☐
Are cylinder protective caps in place except when the cylinder is in use?	☐	☐
Are compressed gas cylinders kept away from sources of heat, elevators, stairs, or gangways?	☐	☐
Are only trained employees, who are judged competent by the employer, allowed to use oxygen or fuel gas equipment?	☐	☐
Do all cylinders (except those with fixed hand wheels) have nonadjustable wrenches, keys, or handles in place on valve stems while cylinders are in use?	☐	☐
Is welding always conducted at a safe distance from flammable liquids or dusty areas?	☐	☐
Are all compressed gas cylinders legibly marked for identifying the content?	☐	☐
Are the valves shut off when the cylinder is not in use?	☐	☐

Resistance Welding

	Yes	No
Are employees using resistance welding machines properly trained?	☐	☐
Are all doors and access panels on resistance welding machines which lead to live electrical parts locked and interlocked?	☐	☐
Do capacitor discharge type of resistance welding machines have safety devices to assure insulation and complete capacitor discharging?	☐	☐
Do all foot switches on resistance welding machines have treadle guards?	☐	☐

NATIONAL ELECTRICAL CODE

Electrical Wiring

Have exposed wires, frayed cords, and deteriorated insulation been repaired or replaced?	☐	☐
Are junction boxes, outlets, switches, and fittings covered?	☐	☐
Is all metal fixed electrical equipment grounded?	☐	☐
Does all equipment connected by cord and plug have grounded connections?	☐	☐
Are electrical appliances, such as vacuums, blowers, vending machines, etc., grounded?	☐	☐
Are all portable electrical hand tools grounded? (Double-insulated tools are acceptable without grounding.)	☐	☐
Are breaker switches identified as to their use?	☐	☐
Do flexible cords and cables not run through holes in wall or ceiling or through doorways or windows?	☐	☐

	Yes	No
Are flexible cords and cables free from splices or taps?	☐	☐
Are flexible cords and cables fastened so that there is no direct pull on joints or terminal screws?	☐	☐
Are flexible cords and cables never substituted for fixed wiring?	☐	☐
Are flexible cords and cables not attached to building surfaces?	☐	☐

RECORDKEEPING (29 CFR 1903.2, 1904.2-.8)

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

INFORMATION SOURCES

American National Standards Institute (ANSI)
1430 Broadway
New York, N.Y. 10018

- ☐ A58.1 Minimum Design Load
- ☐ B15.1 Mechanical Power Transmission
- ☐ B30.2 Overhead and Gantry Cranes
- ☐ B56.1 Powered Industrial Trucks
- ☐ C1 National Electrical Code
- ☐ Z9.2 Local Exhaust Systems
- ☐ Z49 Welding and Cutting
- ☐ Z87.1 Eye and Face Protection

National Fire Protection Association (NFPA)
470 Atlantic Ave.
Boston, Mass. 02210

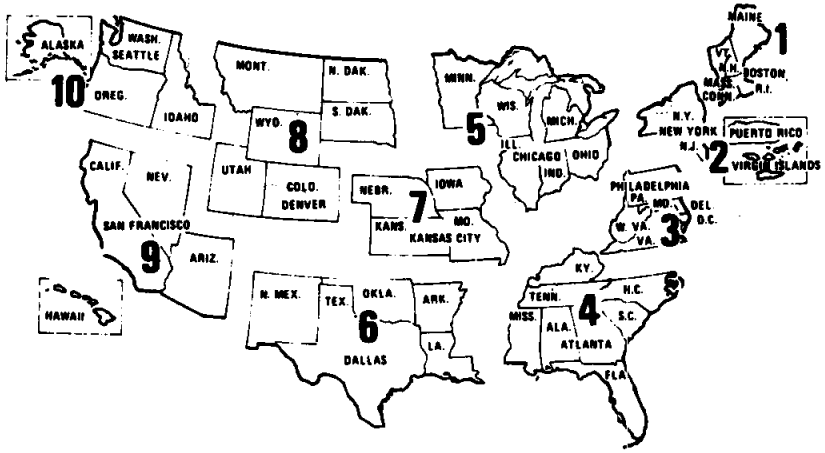
National Safety Council
444 North Michigan Avenue
Chicago, Illinois 60611

Trade associations, state and local governmental agencies, and insurance companies can also provide useful information. The Small Business Administration will provide information concerning procedures for securing economic assistance for compliance with the OSHA Standards (if needed).

NIOSH AND OSHA REGIONAL OFFICES

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

REGIONS



NIOSH REGIONAL OFFICES

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

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

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

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

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

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

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

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

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

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

OSHA REGIONAL OFFICES

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

Region I

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

Region II

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

Region III

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

Region IV

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

Region V

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

Region VI

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

Region VII

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

Region VIII

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

Region IX

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

Region X

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

☆ U.S. GOVERNMENT PRINTING OFFICE: 1977—757-134

KIND OF FIRE

DECIDE THE CLASS OF FIRE YOU ARE FIGHTING. . .

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

APPROVED TYPE OF EXTINGUISHER

MATCH UP PROPER EXTINGUISHER WITH CLASS OF FIRE SHOWN AT LEFT

	FOAM 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 CARTRIDGE Water Expelled by Carbon Dioxide Gas	MULTI-PURPOSE DRY CHEMICAL	ORDINARY DRY CHEMICAL
CLASS A FIRES USE THESE EXTINGUISHERS ORDINARY COMBUSTIBLES • WOOD • PAPER • CLOTH ETC.	A B	X	A	A	A	A B C	X
CLASS B FIRES USE THESE EXTINGUISHERS FLAMMABLE LIQUIDS, GREASE • GASOLINE • PAINTS • OILS, ETC.	A B	B C	X	X	X	A B C	B C
CLASS C FIRES USE THESE EXTINGUISHERS ELECTRICAL EQUIPMENT • MOTORS • SWITCHES ETC.	X	B C	X	X	X	A B C	B C

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 EXTINGUISHER FOR THE CLASS OF FIRE MAYBE DANGEROUS!

TABLE I

HOW TO LIFT SAFELY

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

The factors that contribute to safe lifting are...

DETERMINE IF OBJECTS CAN BE LIFTED AND CARRIED SAFELY.

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.

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

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

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

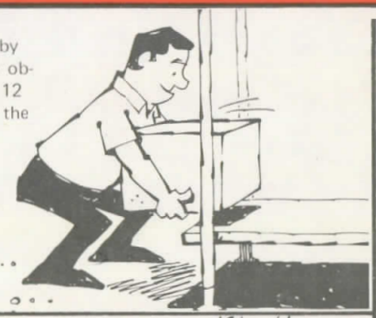
4. Lift the load straight up—smoothly and evenly. Pushing with your legs, keep load close to your body.

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

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

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

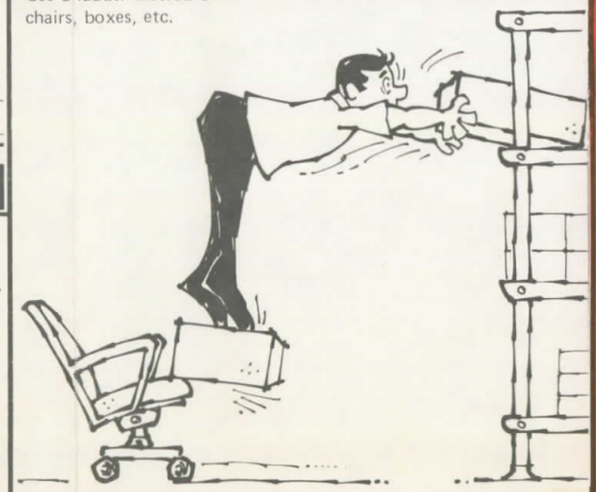
Avoid strain by storing heavy objects at least 12 inches above the floor.



Avoid awkward positions or twisting movements while lifting.

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

Use a ladder instead of chairs, boxes, etc.



NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

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EMERGENCY INFORMATION

FIRE

Telephone Fire Department _____

Nearest Alarm Box at _____

CRIME

Telephone Police _____

INJURY/ILLNESSES

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

Doctor _____

Office _____ Tel. _____

Residence _____ Tel. _____

_____

_____

Hospital _____

Address _____ Tel. _____

Ambulance _____

Address _____ Tel. _____

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

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

1. Name _____ Office Tel. _____

   Address _____ Res. Tel. _____

or

2. Name _____ Office Tel. _____

   Address _____ Res. Tel. _____

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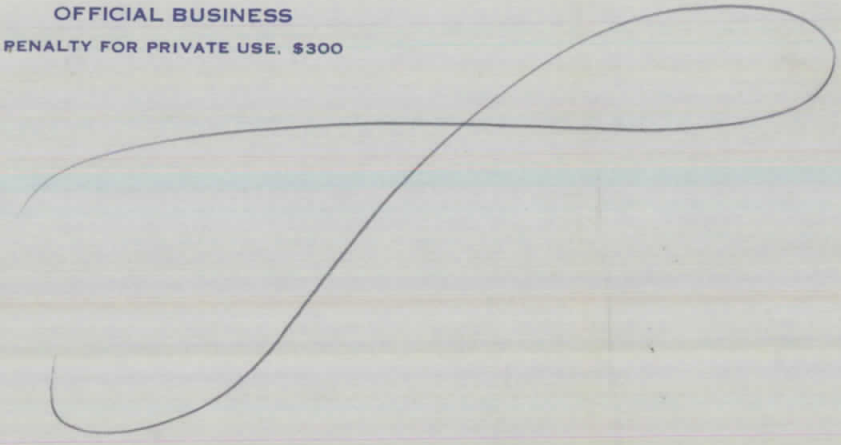

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