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HEALTH AND SAFETY GUIDE FOR THE MANUFACTURERS OF PAINTS AND ALLIED PRODUCTS

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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Guidelines are given for health and safety in the manufacture of paints, varnishes, lacquers, and enamels. Information is given on frequently violated regulations, pigments, extenders, filters, organic solvents, resins, polymers, recordkeeping requirements, and checklists. A list of NIOSH and OSHA Regional Offices is included, along with a Fire Extinguisher chart, an Emergency Information chart, and a "How to Lift Safety" chart.

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Manufacturing
Varnishes
Enamels
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Organic solvents
Polymers
Safety
Paints
Lacquers
Pigments
Filters
Resins

17b. Identifiers/Open-Ended Terms

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Fire extinguisher chart
Emergency information chart

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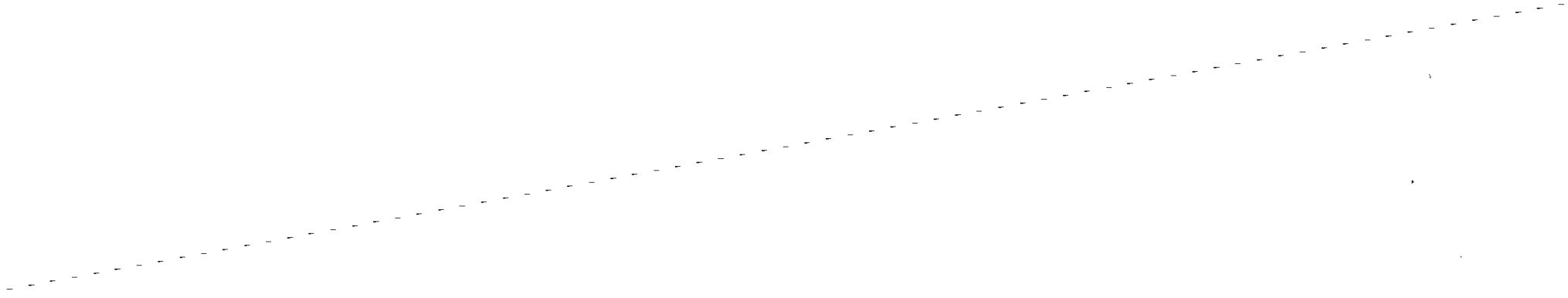

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ACKNOWLEDGMENT

This booklet was prepared by a Task Force in the Division of Technical Services that gathered information from State and Federal agencies, trade associations, insurance companies, etc., and through in-plant visits by NIOSH personnel. Those contributing to the development of the "Health and Safety Guide for Manufacturers of Paints and Allied Products" were: Gerald J. Karches, Director of the Task Force; Howard R. Ludwig, and Bobby J. Gunter.

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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) under the Department of Health, Education, and Welfare (DHEW) and the Occupational Safety and Health Administration (OSHA) under the Department of Labor (DOL). The Act provides for research, information, education, and training in the field of occupational safety and health and authorizes enforcement of the standards. As part of these activities, surveys have been made by NIOSH to determine the most common health and safety problems in small businesses. This Guide includes a "Guidelines" section and a section on "Frequently Violated Regulations"; it is being distributed throughout the industry.

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 "general industry standards Title 29 Code of Federal Regulations—Part 1910".

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

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

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HEALTH AND SAFETY GUIDELINES

HEALTH AND SAFETY PROGRAM

Hazardous conditions or practices not covered in the OSHA standards are covered under the general duty clause of the Act which states "Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees".

An effective method to assist in providing for a safe working environment is through a health and safety program. The purpose of such a program is to recognize, evaluate, and control hazards and potential hazards in the workplace.

Hazards may be identified by investigating accidents, reviewing injury and illness records, soliciting employee input (interviews, suggestions, and complaints), performing self-inspections, using material in this Guide, and other information sources. Typical examples are unsafe walking surfaces, unguarded machinery, electrical hazards, improper lifting, air contaminants, etc. The "Checklist" in the back of this book is of particular importance in identifying hazards. It can be customized to fit the needs of the program.

Those situations which tend to occur most frequently or to cause the most severe problems should be given priority for corrective action. This Guide contains many of the requirements and good practices needed to correct the hazards that have been identified.

For more complex problems, such as those requiring engineering controls to reduce noise or airborne contamination, outside consultants may be needed.

Management may want to assign responsibilities in the areas of both program development and implementation. Regular meetings or informal discussion can be held to discuss safety promotions, hazards, injury and illness records, etc. To ensure the success and progress of the program, management leadership is necessary. The person assigned responsibility, for instance the foreman, must be delegated the authority and have management support to carry out the part of the program assigned to him. Likewise, everyone in the establishment should be aware of the activities of the program through a systematic interchange of information. Employees cannot

HEALTH AND SAFETY GUIDELINES (cont.)

take an interest in the program if they are unaware of what is occurring. Conversely, well informed personnel will likely show interest and a desire to participate.

REDUCING UNSAFE ACTS AND PRACTICES

EMPLOYEE TRAINING

A safe operation largely depends upon employees who are properly informed and aware of potential hazards. Training needs will vary according to the complexity of the operation. Some suggestions are to:

1. Impress upon the worker the need for constant awareness—even during automatically controlled operations.
2. Be sure **all** employees know when and how to use appropriate personal protective equipment, if needed.
3. Develop and maintain check points to be observed as a part of the standard and emergency procedures during each shift.
4. Post appropriate warning signs and operating procedures.
5. Instruct employees in the use of portable fire extinguishers. (Refer to fold-out chart in this booklet and post in a conspicuous place.)
6. Have at least one person trained in first aid on each shift.
7. Be sure that employees who are authorized to use motorized equipment are thoroughly instructed in its operation and potential hazards.
8. Develop a "good housekeeping" awareness to reduce accidents and to develop the employees' sense of pride in their surroundings. An individual should be assigned responsibility for clean-up.
9. Instruct employees in safe-lifting practices. Such instructions may prevent many injuries. An easily understood chart, "How to Lift Safely", is included in the back of this book for posting where it may be seen by employees.

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HEALTH AND SAFETY GUIDELINES (cont.)

GOOD HOUSEKEEPING HELPS PREVENT FIRES

Maintaining a clean and orderly workplace reduces the danger of fires. Combustible material of any type should be kept only in places which are isolated by fire-resistive construction.

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

The materials used for cleaning can create 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:

1. Electrical malfunctions
2. Friction
3. Open flames
4. Sparks
5. Hot surfaces
6. Smoking

Proper maintenance and awareness of these conditions through a safety program can reduce these hazards.

MANUFACTURE OF PAINTS, VARNISHES, LACQUERS, AND ENAMELS

The manufacture of paints, varnishes, and lacquers involves the handling of many materials such as pigments, extenders, fillers, driers, film-forming oils, latex emulsions, synthetic or natural resins, solvent thinners, etc. Many of these materials when used or handled improperly are potential health hazards (see "Occupational Health and Environmental Control"). Excessive inhalation of dusts and solvent vapors must be avoided. Contact with solvents and many of the resins used may cause skin irritation leading to a condition called dermatitis.

There are a number of machines used in the mixing and dispersion of paint constituents including high-speed agitators, sand mills, ball or pebble mills, and roller mills. All ex-

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HEALTH AND SAFETY GUIDELINES (cont.)

posed gears, belts, and other power transmission apparatus must be guarded (see "Machine Guarding"). High-speed agitator or disperser blades must be inaccessible to the worker while in operation to prevent possible injury. An interlocking arrangement should be used to stop an impeller from operating if raised from a mixing vat. Roller mills have an obvious danger zone along the nip point line formed by the oppositely rotating rollers. A guard (perhaps a clear plastic shield) that will permit paint to flow into the nip point but prevents the operator's hands from accidentally being caught is needed.

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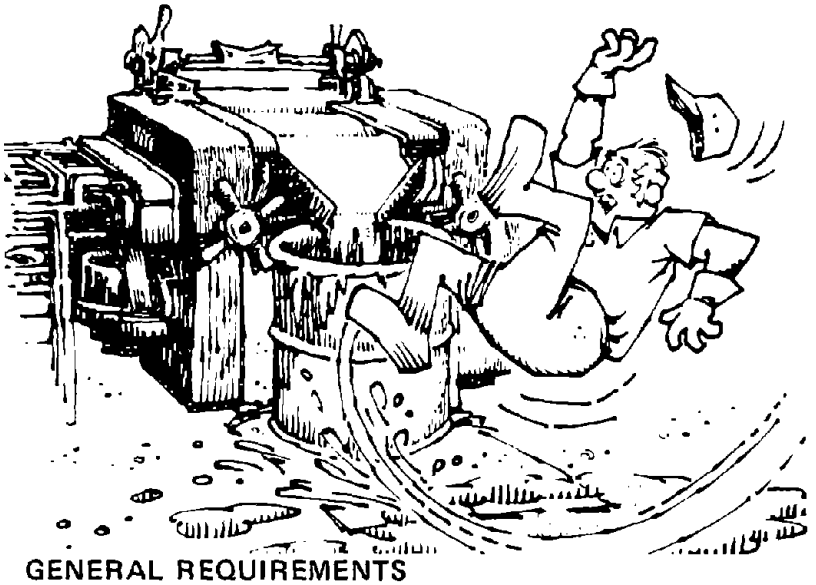
FREQUENTLY VIOLATED REGULATIONS

WALKING AND WORKING SURFACES



GENERAL REQUIREMENTS

1. The workplace must be maintained clean, orderly, sanitary, and as far as possible, in a dry condition. Spills should be cleaned up promptly.

2. Areas which are constantly wet should have nonslip surfaces where personnel normally 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 clearances must be provided for aisles at loading docks, through doorways, and wherever turns or passage must be made. Aisles must not be obstructed.

5. All permanent aisles must be easily recognizable. Usually aisles are identified by painting or taping lines on the floor.

6. The floor load capacity is the maximum weight which can be safely supported by the floor, expressed in pounds per square foot. When this information is not available and when floor load capacity is in doubt, a competent engineer should be consulted. These floor load capacities must be posted in a readily visible location (except for slab floors with no basements).

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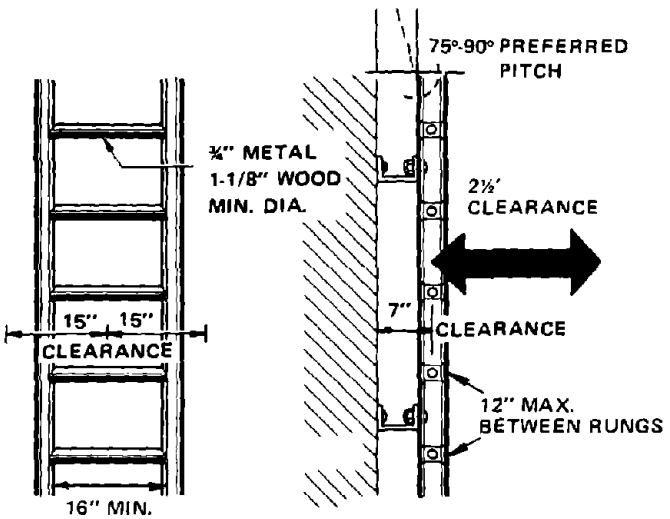
FREQUENTLY VIOLATED REGULATIONS

WALKING AND WORKING SURFACES (cont.)

FIXED LADDERS MUST:

1. Be designed to withstand a single concentrated load of at least 200 pounds.
2. Have rungs with a minimum diameter of ¾ inch for metal ladders, or 1⅛ inches for wood ladders.



3. Not have rungs spaced more than 12 inches apart and must be at least 16 inches wide.
4. Be painted (if metal) or otherwise treated to resist deterioration when location demands.
5. Have a preferred pitch of 75°-90° for safe descent.
6. Have 2½ foot clearance for ladders with 90° pitch and 3 feet for 75° pitch on the climbing side of ladder (unless caged).
7. Have at least seven inches clearance in back of the ladder to provide for adequate toe space.
8. Be equipped with cages if they are longer than 20 feet.
9. Have landing platforms if they are more than 30 feet long. A platform every 30 feet for caged ladders and every 20 feet for unprotected ladders is required.
10. Have side rails extend 3½ feet above landings.
11. Have a clear width of 15 inches on each side of the center line of the ladder (unless with cages or wells).

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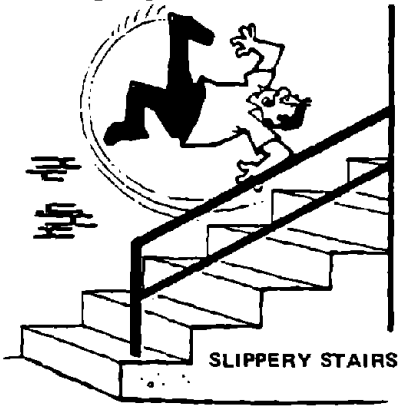
WALKING AND WORKING SURFACES (cont.)

PORTABLE LADDERS

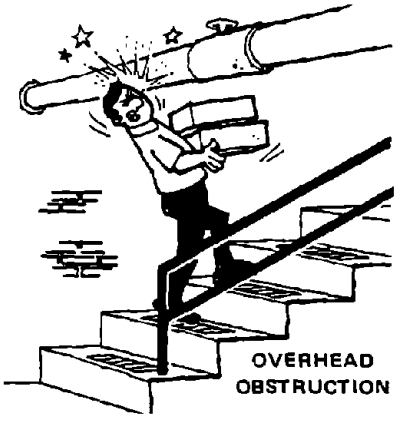
1. Must be maintained in good condition at all times.
2. Should be kept coated with a suitable protective material. Wood ladders can be painted if carefully inspected prior to painting, providing the ladder is not for resale.
3. Must be inspected frequently. Those which have developed defects must be tagged, "DANGEROUS—DO NOT USE" and be removed from service for repair or destruction.
4. Wood ladders should be stored where they will not be exposed to the elements and where there is good ventilation.
5. Metal ladders should not be used near energized electrical equipment.
6. Must be so placed that the side rails have a secure footing. They may not be placed on boxes, barrels, or other unstable bases to obtain additional height. Nonslip bases should be used.

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 seven feet, measured from the leading edge of the tread.



SLIPPERY STAIRS



OVERHEAD OBSTRUCTION

4. The minimum permissible width is 22 inches (if a means of exit access, at least 28 inches).

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WALKING AND WORKING SURFACES (cont.)

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 nine inches wide, the risers should be open.

8. Certain conditions applied to flights of stairs having four or more risers:

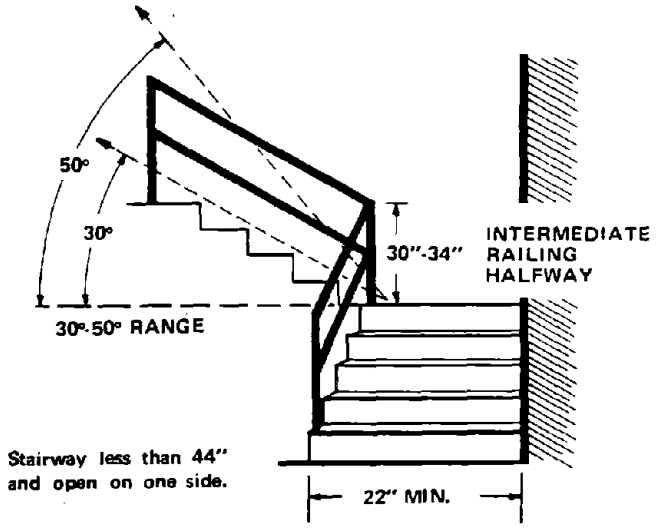
a. A stair railing is required on each open side.

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 more than 44 inches wide, a handrail is required on each enclosed side.

d. Furthermore, if the stairway is 88 or more inches wide, an intermediate stair railing located midway is also required.

9. The vertical height of the railing must be 30 to 34 inches and of construction similar to the standard railing described later in this section.



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WALKING AND WORKING SURFACES (cont.)

THE STANDARD RAILING AND TOEBOARD

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

A standard 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. For wood railings, the rails and posts must be of at least 2 x 4-inch stock with posts spaced not more than six feet.

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

For structural steel railings, posts and rails must be of 2 x 2 x 3/8-inch angles or other metal shapes of equivalent strength with posts spaced not more than eight feet.

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

WHERE A STANDARD RAILING IS REQUIRED

1. Every open-sided floor or platform four feet or more above the adjacent floor or ground level, must be railed on all open sides except where there is entrance to a ramp, stairway, or fixed ladder.
2. Every stairway floor opening must be guarded on all exposed sides except the entrance to the stairway.
3. Every ladderway floor opening must be guarded by a standard railing and toeboard on all sides, with passage through the railing so constructed as to prevent a person from walking directly into the opening.
4. Every open vat or mixer whose top edge is near the floor or platform.

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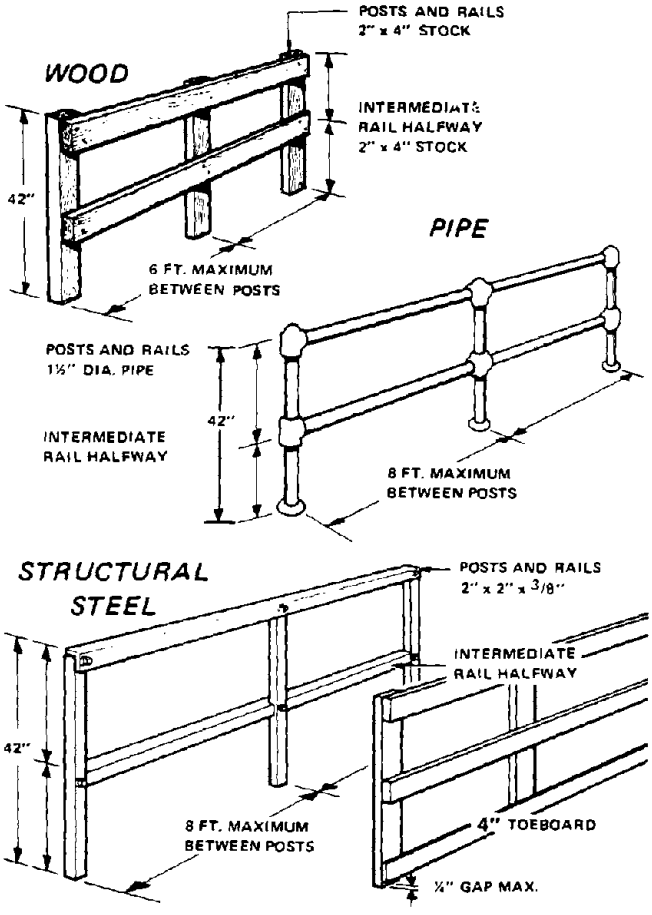
WALKING AND WORKING SURFACES (cont.)

As a general condition: A standard toeboard and 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).

STANDARD RAILINGS AND TOEBOARDS



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EXITS AND EXIT MARKINGS

1. Every exit must have the word "EXIT" in plain legible letters not less than six inches high with the strokes of the letters not less than ¾ inches wide.

2. 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 marked by a sign indicating their actual use, e.g., "STORAGE ROOM", "TO BASEMENT", etc.

3. When the direction to the nearest exit may not be apparent to an occupant, an exit sign with an arrow indicating direction must be used.

4. 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 physical barriers).

5. Nothing may impair the visibility of the exit sign, such as decorations, furnishings, or other signs.

6. 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:

   a. 50 or more persons occupy a room or

   b. the exit is for an area of high hazard potential.

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FREQUENTLY VIOLATED REGULATIONS

EXITS AND EXIT MARKINGS (cont.)

7. Areas around exit doors and passageways leading to and from the exit must be free of obstructions. The exit route must lead to a public way.

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

9. No lock or fastening may be used to prevent escape from inside the building.

10. Where occupants may be endangered by the blocking of any single exit due to fire or smoke, there must be at least two means of exit remote from each other.

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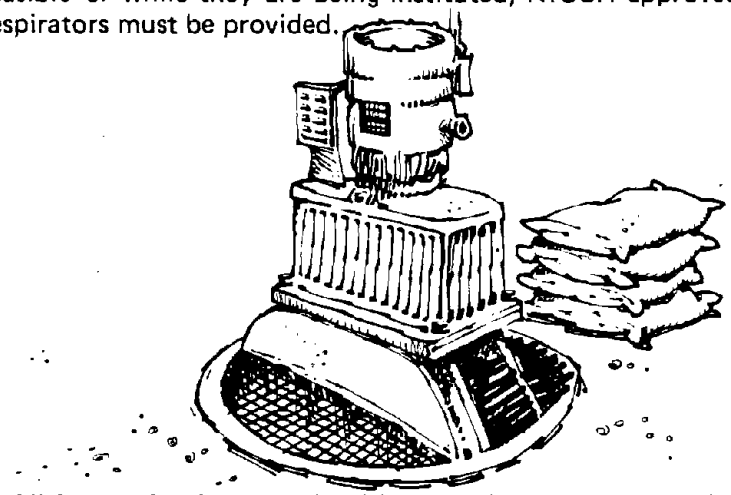
FREQUENTLY VIOLATED REGULATIONS

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL

PIGMENTS, EXTENDERS, AND FILLERS

The dry constituents of paints such as pigments, extenders, and fillers should be handled carefully in the receiving and storage areas as well as in product formulation to prevent overexposure of workers to airborne dusts. Spills should be promptly cleaned up before the material is spread throughout the area. If during the addition of pigments or extenders to formulating tanks employees could be overexposed to toxic dusts, engineering controls must be instituted. If engineering controls (ventilation, enclosure, automation, etc.) are not feasible or while they are being instituted, NIOSH approved respirators must be provided.



All inorganic pigments should be considered as potentially toxic. Special care should be given to avoid overexposure of workers when pigments containing lead and metallic chromates (corrosion inhibitors), cadmium, copper, or cobalt are used. Arsenic and mercury compounds used in anti-fouling marine paints should also be handled carefully. Employees may inhale these materials and if good personal hygiene is not observed employees may ingest significant amounts through contact of dirty hands with food or cigarettes.

Extenders or fillers such as silica, asbestos, talc, or mica when breathed in excessive amounts will cause in increase in

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FREQUENTLY VIOLATED REGULATIONS

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL (cont.)

the amount of fibrous connective tissue (fibrosis) in the lungs, resulting in impaired breathing. Silicosis is caused by free silica (uncombined SiO_2) which is found in a number of paint extenders such as finely ground crystalline quartz, quartzite, sand, silica flour, etc. The symptoms associated with overexposure to silica may not clinically be "seen" for 10 to 20 years depending on the exposure levels and duration.

Asbestos is a generic term that applies to a number of naturally occurring fibrous hydrated mineral silicates such as chrysotile, amosite, crocidolite, etc. Overexposure to these substances will lead to asbestosis, a fibrosis of the lung which may not become apparent for 10 to 20 years after initial exposure. Every establishment where asbestos may become airborne must be surveyed at least initially to determine whether exposure of employees to asbestos fibers is in compliance. No asbestos-containing material (sometimes used as a paint extender) shall be removed from bags, cartons, or other shipping containers without being either wetted, enclosed, or ventilated so as to effectively prevent the release of airborne asbestos fibers in excess of OSHA standards. Compliance may be achieved by the use of NIOSH-approved respirators or shift rotation **only** during the installation of engineering controls, emergencies, or when control methods are technically not feasible. Employees exposed to asbestos must be given an annual physical examination which includes a chest X-ray and pulmonary function tests.

Fillers containing talc or mica, although not as hazardous as free silica or asbestos, can also lead to lung damage and employee exposure must be controlled.

A pigment such as titanium dioxide or a filler such as gypsum are considered to be "nuisance" dusts. Dust levels must nevertheless be controlled to ensure good visibility, a lack of eye irritation, and to prevent massive lung deposition.

ORGANIC SOLVENTS

Organic solvents find wide application in the paint industry. Solvents are used to suspend pigments, dissolve film-forming oil materials, and as thinners to dilute paints and

reduce paint viscosity. All organic solvents have some effect on the central nervous system and the skin. The principal modes of exposure are inhalation of vapors 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, kidney and gastrointestinal tract. You should acquaint yourself and your employees with the properties and hazards of the solvent you use.

Skin contact with solvents may cause dermatitis, ranging in severity from a simple irritation to actual damage to the skin. Even the most inert solvents can dissolve the natural protective barriers of fats and oils, leaving the skin unprotected. When these natural lubricants are removed, the skin becomes subject to disabling and possibly disfiguring dermatitis and opens the way to serious infection.

CONTROL OF EXPOSURES

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

Substitution of a less toxic or less volatile solvent is effective in controlling solvent exposure and reducing the hazard potential. However, this control method is more easily instituted when the actual function of the solvent is less specific than it is in paint formulating, such as in metal cleaning or degreasing operations. Nevertheless, the principle of substitution should be followed where possible to reduce the hazard potential to both the formulator and the customer who applies the product. The substitution of a less toxic solvent does not imply that a health hazard has been eliminated; it only means that a worker is less likely to suffer ill effects.

The use of closed systems and local exhaust ventilation is an effective way of preventing solvent vapors from entering the breathing zone of the worker. Containers of flammable

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL (cont.)

solvents must be covered when not in use. Local exhaust ventilation can remove vapors at their point of origin and thus prevent toxic concentrations in the workplace.

Good personal hygiene is essential whenever solvents are used. The skin should always be protected from contact with solvents. Gloves, face shields, goggles, and other protective clothing may be used. Similarly, barrier creams may offer some degree of protection. The skin should never be washed with any raw organic solvent. Although some solvents are less toxic than others, good safety practices dictate that care be exercised in the use of any organic industrial solvents.

RESINS

There are many different types of resins used in the formulation of varnishes and lacquers. Some resins such as the alkyd and nitrocellulose types are widely used and present little in the way of health hazards. Other resins, however, may have potential problems associated with their usage.

FORMALDEHYDE RESINS

Formaldehyde based resins (phenol, urea, or melamine types) are potential skin irritants, and adequate protective clothing should be provided to prevent skin contact.

POLYESTER RESINS

Polyester resins may contain styrene as a solvent and cross-linking agent. Since styrene is irritating to the eyes and lungs at low air concentrations, and may cause nausea, headache, and dizziness at higher concentrations, it may be necessary to provide ventilation.

ACRYLICS

The polymerization effect of acrylic resins is also utilized in paints. However, many acrylic monomers (e.g., methyl or ethyl acrylate) are potential eye and throat irritants and continued over-exposure may lead to liver and kidney damage. Adequate ventilation may be required to reduce air con-

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL (cont.)

centrations. Excessive skin contact with most liquid acrylics must be avoided, so protective clothing is essential. Acrylates, such as methyl methacrylate, are flammable liquids (see "Hazardous Materials").

EPOXY RESINS

Epoxy resins used in protective coatings should be regarded and handled as hazardous materials. Dermatitis, an inflammation of the skin, may develop from having repeated contact. Certain individuals may develop an allergic reaction to even trace amounts of epoxies. Some dermatitis symptoms include: redness, itching, swelling, and blisters. Respiratory, nose, and throat irritation, headache, and nausea may result from breathing the dusts.

POLYURETHANE RESINS

Isocyanates are polymerized to form a polyurethane. Generally, isocyanates are irritating to the eyes, skin, and respiratory tract, so precautions should be taken to avoid skin contact or inhalation of the vapors. Particular care should be given when handling toluene-2,4-diisocyanate (TDI) or methylene bisphenyl isocyanate (MDI) because sensitivity reactions with asthma-like symptoms can be produced at very low air levels.

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FREQUENTLY VIOLATED REGULATIONS

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL (cont.)

OCCUPATIONAL NOISE EXPOSURE

Excessive noise is one of the most commonly violated standards and can cause permanent hearing damage. To protect employees it is management's responsibility to make sure they are not exposed to noise levels in excess of the standards. The current standard is 90 decibels, A-weighted (dBA), for an eight-hour exposure. Even at this noise level, hearing damage can be expected in some individuals. It may soon be a requirement, and it is considered good practice, to have hearing checked (audiometric testing) on an annual basis, for all employees exposed to 85-90 dBA noise levels for eight hours daily. If no hearing loss is observed, ear protection is not required.

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

The following table is provided to assist in the evaluation of the noise levels in the workplace. If referral to the table indicates that levels and time of exposure are such that corrective action is needed, it is recommended that professional help be sought to correct the problem. A noise survey by adequately equipped and trained personnel should be made before implementing engineering and administrative controls, and/or setting up a hearing conservation program.

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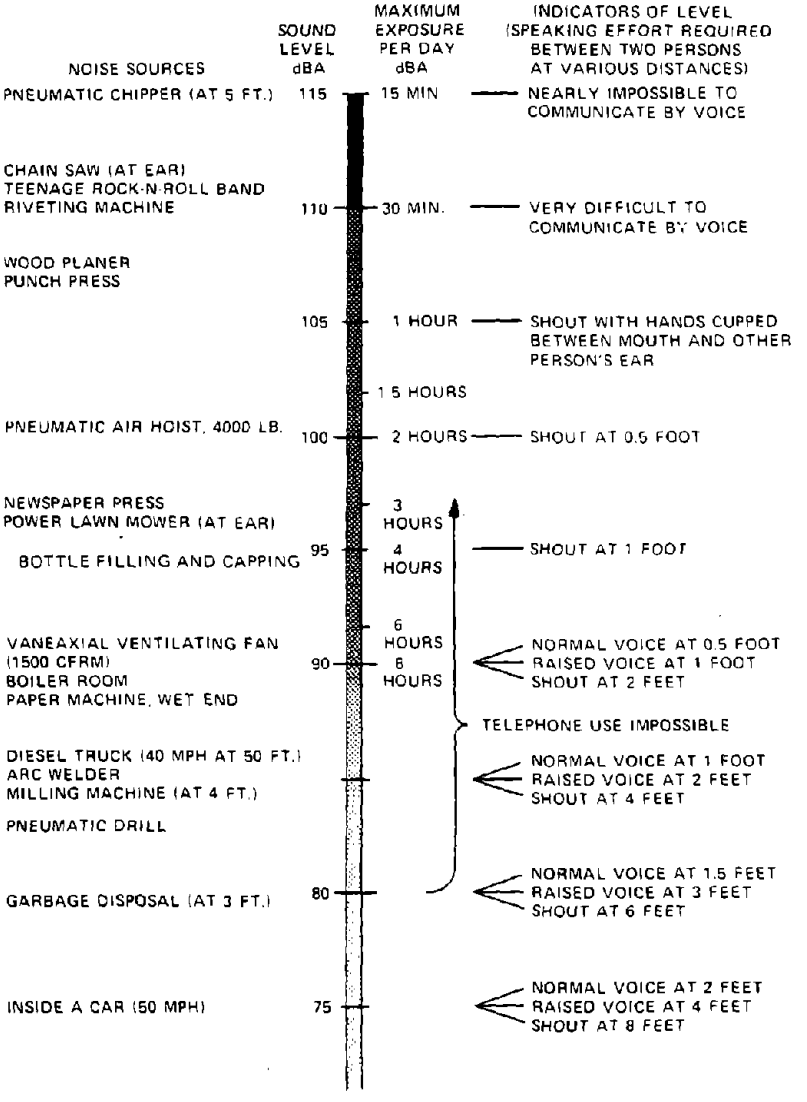
OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL (cont.)

PERMISSIBLE NOISE EXPOSURES



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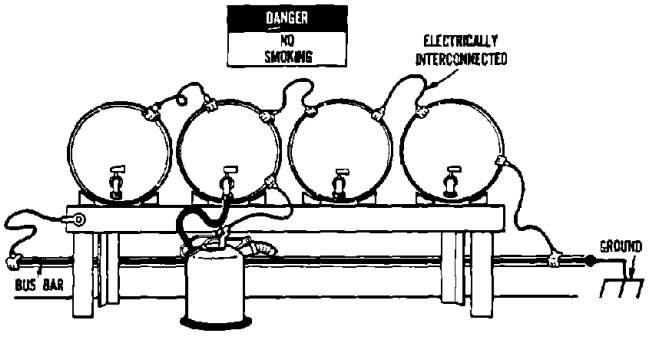
FREQUENTLY VIOLATED REGULATIONS

HAZARDOUS MATERIALS

Flammable and combustible liquids are categorized by their ease of ignition. Flammable liquids are more easily ignited than combustible ones. Some examples of flammables are gasoline, acetone, lacquer thinner; and examples of combustibles are kerosene, fuel oil, Stoddard solvent, etc.

1. The 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, for example, from a bulk container to a portable container, they must be effectively bonded and grounded. This practice prevents electrical discharge (e.g., sparks) from the accumulation of static charge because of the transfer process.



3. All spills of flammable or combustible liquids must be cleaned up promptly. With major spills remove ignition sources, ventilate the area, and provide appropriate protective equipment to cleanup personnel. These liquids must not 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 flash screens and self-closing lids. These containers can be purchased in an industrial supply house.

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

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

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FREQUENTLY VIOLATED REGULATIONS

HAZARDOUS MATERIALS (cont.)

STORAGE CABINETS

No more than 60 gallons of flammable or 120 gallons of combustible liquids may be stored in a storage cabinet. Cabinets must be distinctly designated "FLAMMABLE—KEEP FIRE AWAY", and be able to withstand a 10-minute fire test, the internal temperature remaining at 325°F or less.

Metal cabinets must be constructed of at least No. 18 gauge sheet iron, double-walled with a 1½-inch air space between. Doors must have three-point locks with the sill raised at least two inches above the cabinet floor.

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

INSIDE STORAGE ROOMS

Adequate venting should be provided in all areas where flammable liquids are stored. Roof venting is very important in the event of a fire. The use of roof vents allows smoke and heat to escape, thus, in the event of a fire, fire fighters can get nearer to the fire.

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

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

OUTSIDE STORAGE

If flammable and combustible liquids are stored outside, the area should be graded so that spills are diverted away from the building. The storage area should be kept free of combustible material not necessary for storage such as weeds and other debris. Smoking must be prohibited.

NIOSH

FREQUENTLY VIOLATED REGULATIONS

HAZARDOUS MATERIALS (cont.)

PAINT SPRAY BOOTHS

1. Spray booths must be made of noncombustible material (i.e., metal, masonry) and be smooth on the inside to aid in cleaning.
2. The baffles must be noncombustible and easily cleaned.
3. Spray-booth lights must be explosion proof, or sealed clear panels.
4. Ventilation:

a. Mechanical ventilation must be installed and operating during spraying.

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

c. The electric motors for the exhaust fan must be placed outside the booth or ducts and the belts and pulleys fully enclosed.

d. The air exhausted from the paint booth must be discharged outside where it cannot reenter the building.

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

UNDERGROUND STORAGE TANKS

Underground tanks must be covered with a minimum of two feet of earth or a foot of earth and a slab of concrete at least four inches thick. Where underground tanks are subject to traffic, they must be covered by at least three feet of earth or 18 inches of earth plus six inches of reinforced concrete or eight inches of asphaltic concrete.

There are times when underground tanks develop leaks and the leakage drains into adjacent basements, pits, sewers, or manholes. Whenever possible, locate underground tanks or far as you can from below-grade open areas.

Underground storage tanks have specific venting requirements for Class I (flammable) liquids. Vent pipes are to be placed so that the point of discharge is outside of all buildings. The vent pipe must be higher than the fill pipe opening and not less than 12 feet above the surrounding ground level. Vent pipes must only discharge upward in order to disperse vapors. If the pipe is more than two inches (inside diameter), the outlet must be provided with a vacuum and pressure relief device or there must be an approved flame arrester located in the vent line at the outlet.

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FREQUENTLY VIOLATED REGULATIONS

PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment is required whenever toxic substances can do bodily harm through absorption, inhalation, or physical contact. Various processes, environments, chemicals, or mechanical irritants—even radiologic procedures—constitute hazards for which personal protective equipment must be provided. This equipment includes protective devices for the eyes, face, head, and extremities, as well as protective clothing and respiratory devices. Furthermore, it must be safely designed and sufficiently well-constructed to provide the protection for which it is intended.

It is required that all personal protective equipment be maintained in a sanitary and reliable condition.

EYE PROTECTION

Eye protection is required where there is a possibility of an eye injury from flying particles, chips, dusts, solvents, caustic materials, etc. Employees must wear eye protection when using grinders, power drills, etc.

HEARING PROTECTION

Appropriate hearing protection must be available to personnel, and used, where noise levels are in excess of 90 dBA. Such sound intensity is likely to occur around powerful motors or grinding mechanisms such as ball mills.

PERSONAL PROTECTIVE CLOTHING

GLOVES

When handling hazardous liquids, employees must wear gloves which are impervious to such liquids. The gloves must be long enough to protect the forearms.

HEAD PROTECTION

Hard hats are required in a situation where workers may be subjected to impact or penetration from falling or flying objects.

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.

NIOSH

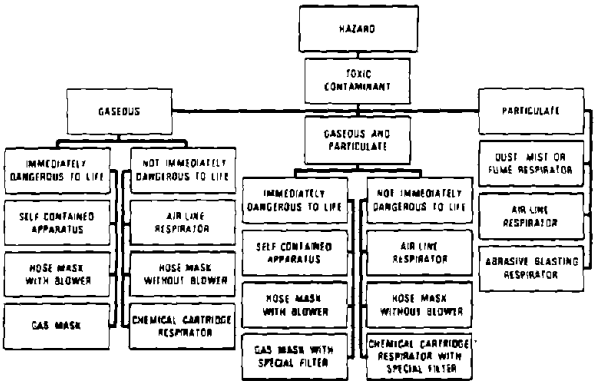
FREQUENTLY VIOLATED REGULATIONS

PERSONAL PROTECTIVE EQUIPMENT (cont.)

RESPIRATORY PROTECTION

NIOSH-approved respirators must be provided by the employer when air is excessively contaminated with harmful dusts, fumes, mists, gases, or vapors until engineering or other controls are instituted to reduce exposure or if these measures prove to be inadequate. 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.
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, 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.



NIOSH

FREQUENTLY VIOLATED REGULATIONS

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.

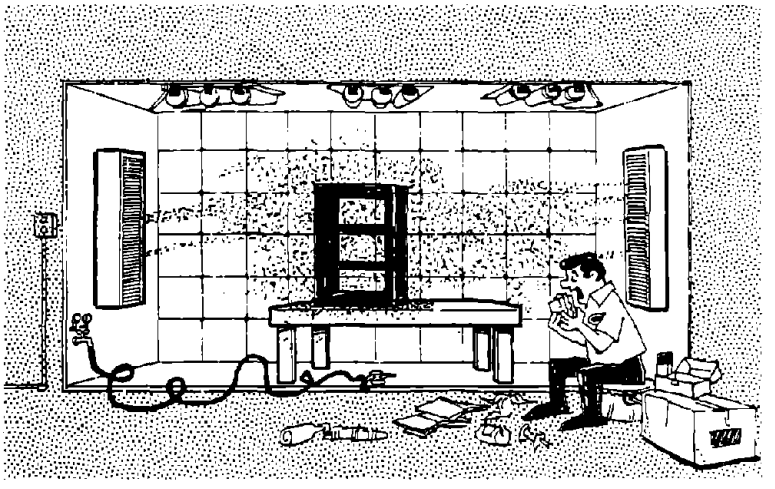
3. Restrooms are to be kept in a clean and sanitary condition, including covered containers for sanitary napkins.

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.

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 materials which could be hazardous if ingested.



8. Employees working with hazardous substances should wash and remove contaminated clothing before eating, drinking, or smoking.

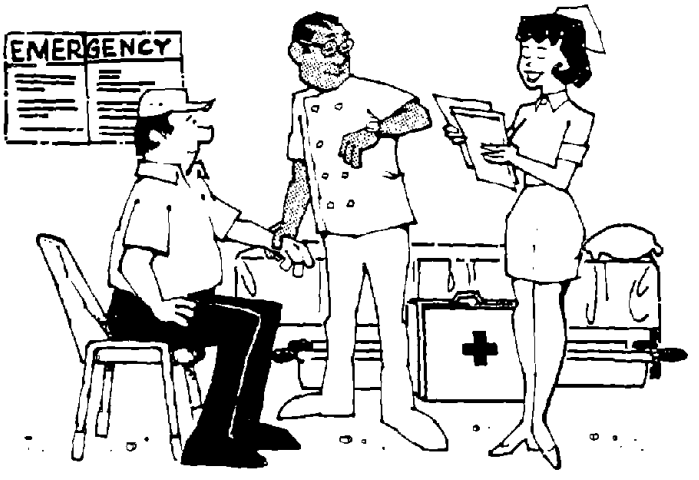
NIOSH

FREQUENTLY VIOLATED REGULATIONS

MEDICAL AND FIRST AID

The employer interested in maintaining production, preventing loss of work time, receiving efficient employee performance, and achieving good morale should adopt ways of preserving employees' health. A good practice is to require preplacement medical examinations to insure that prospective employees are physically able to do the specific work. Periodic health evaluations for hazardous jobs and early treatment of any illness or injury should also be encouraged. On matters of health, medical personnel must be readily available by phone or on-site for advice and consultation.

Emergency phone numbers should be posted near telephones (see "Emergency Information Chart" on the back cover). 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 in near proximity to the workplace (usually interpreted to be within 10 minutes under the worst conditions) which is used for treatment of injured or ill employees, 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 provide acceptable training.

NIOSH

FREQUENTLY VIOLATED REGULATIONS

MEDICAL AND FIRST AID (cont.)

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

Suitable facilities for quick drenching or flushing of the eyes and body must be provided within the work area when a person may be exposed to injurious corrosive materials.

Note: First aid is immediate, temporary treatment given in the event of accident or illness—before the doctor arrives.

Some states have laws concerning first aid requirements including supplies (kits), training, and instructions on first aid given by the lay person. Trained employees should understand where first aid ends and treatment by a physician begins.

Reference to "Recordkeeping Requirements" toward the back of this Guide gives a discussion of records which must be maintained for occupational injuries and illnesses.

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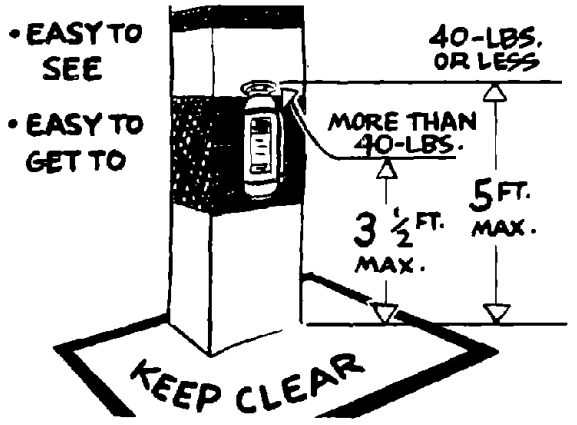
FREQUENTLY VIOLATED REGULATIONS

FIRE PROTECTION



PORTABLE 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 five feet (to the top of the extinguisher) if 40 pounds or less, or 3½ feet if heavier.
5. Be inspected by management or a designated employee at least monthly to insure that they:
   a. Are in their designated places.
   b. Have not been tampered with or actuated.
   c. Do not have corrosion or other impairment.
6. Be inspected at least yearly and/or recharged or repaired to insure operability and safety; a tag must be attached to show the maintenance or recharge date and signature or initials of the person performing the service.
7. Be hydrostatically tested. The extinguisher sales representative 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.

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FREQUENTLY VIOLATED REGULATIONS

FIRE PROTECTION (Cont.)

TYPES OF SPRINKLER SYSTEMS

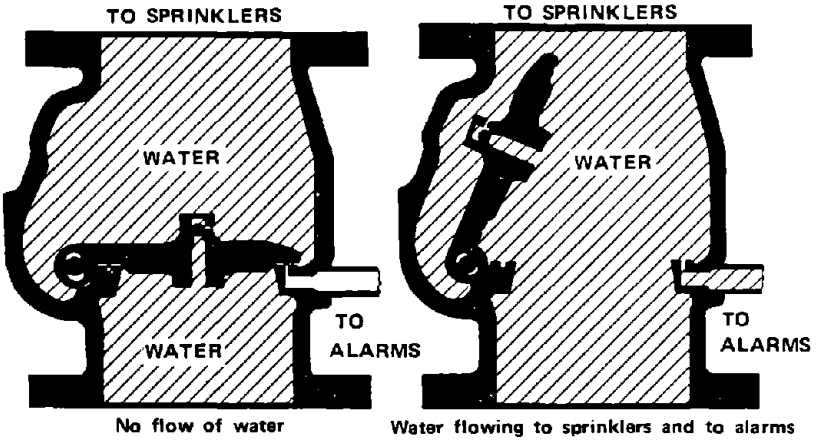
WET-PIPE SPRINKLER SYSTEMS

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

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

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

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



No flow of water

Water flowing to sprinklers and to alarms

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FREQUENTLY VIOLATED REGULATIONS

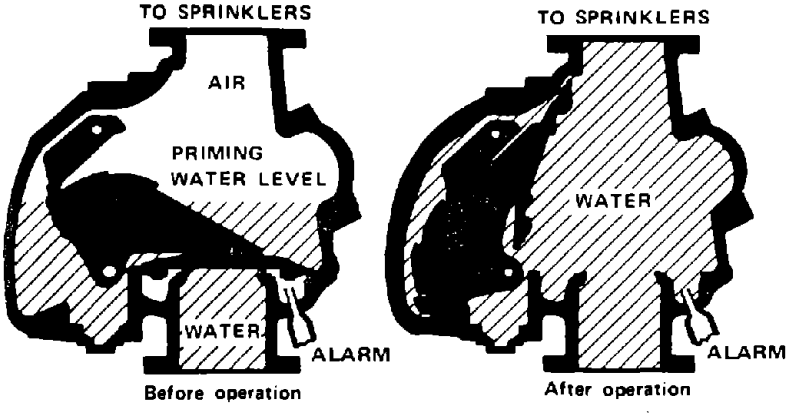
FIRE PROTECTION (cont.)

DRY-PIPE SYSTEMS

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

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

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



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FREQUENTLY VIOLATED REGULATIONS

FIRE PROTECTION (Cont.)

PRE-ACTION SPRINKLER SYSTEMS

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

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

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

THE DELUGE SYSTEM

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

SPRINKLER ALARMS

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

1. Such waterflow alarms must be provided on all sprinkler installations.
2. All alarms must be located where they are accessible for inspection, removal, and repair.
3. Under conditions of variable water pressure, a retarding device must be installed. The installation must have valves that allow repair or removal without shutting off the sprink-

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FREQUENTLY VIOLATED REGULATIONS

FIRE PROTECTION (cont.)

lers. The valves must be arranged so that they may be locked or sealed in the open position.

DRY CHEMICAL SYSTEMS

Dry chemical, fire protection systems must meet the design requirements of the National Fire Protection Association (NFPA No. 17-1969). Alarms or indicators of system operations are required with thorough inspections made of the system at least annually. A report of the inspection by a competent inspector should be kept on file. Informal, visual inspections should also be made on a regular basis. These systems must be maintained in adequate operating condition at all times.

CARBON DIOXIDE SYSTEMS

1. When a carbon dioxide system is discharged, an oxygen deficient atmosphere may exist. Suitable safeguards shall be provided to insure prompt evacuation of and to prevent entry into such atmospheres.
2. At least annually, all carbon dioxide systems shall be thoroughly inspected and tested for proper operation.
3. All high pressure cylinders shall be weighed twice a year. If the net contents show a loss of more than 10%, it shall be refilled or replaced.
4. If low pressure containers show a loss of 10% or more, it shall be refilled unless minimum gas requirements are provided.

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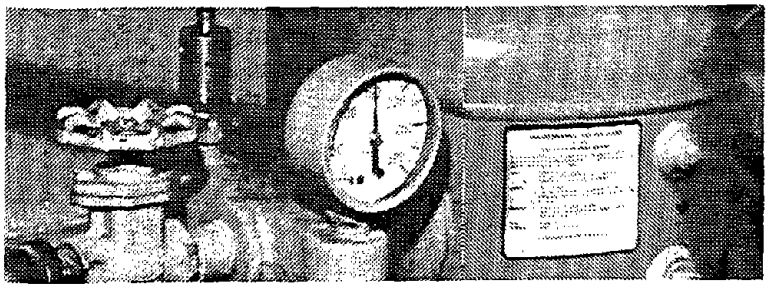
FREQUENTLY VIOLATED REGULATIONS

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.

6. For the safe use and maintenance of steam pressure vessels consult your local or state code for applicable requirements.

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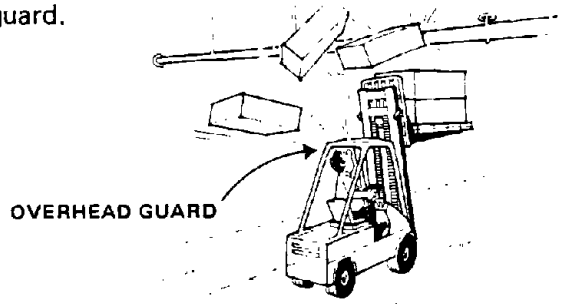
FREQUENTLY VIOLATED REGULATIONS

MATERIALS HANDLING AND STORAGE

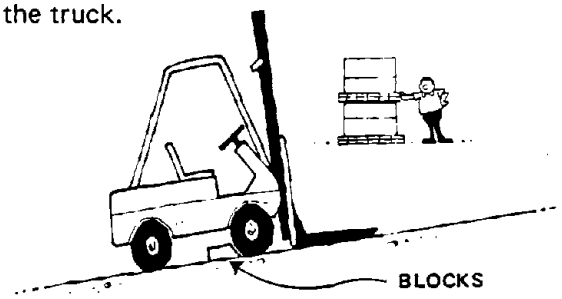
POWERED INDUSTRIAL TRUCKS

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. Only approved power-operated (electric) industrial trucks designated as EX may be used in locations where flammable vapors **may** be present in quantities sufficient to produce explosive or ignitable mixtures.

1. High-lift-rider trucks must be fitted with an overhead guard.



2. Methods must be developed and used to effectively train operators in the safe operation of powered industrial trucks, and only trained and authorized operators may operate the truck.



3. When a powered industrial truck is left unattended (operator more than 25 feet from the truck), the forks must be fully lowered, the control lever positioned in neutral, the power shut off, and the brakes set. The wheel must be blocked if parked on an incline.

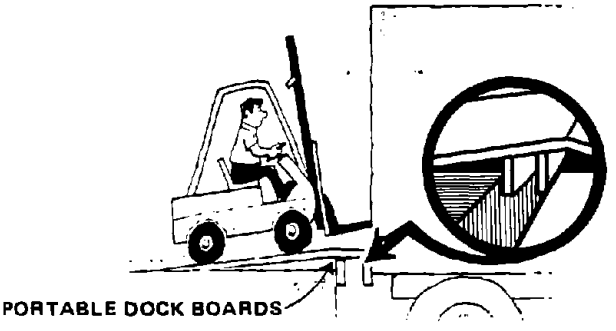
NIOSH

FREQUENTLY VIOLATED REGULATIONS

MATERIALS HANDLING AND STORAGE (cont.)

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.

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FREQUENTLY VIOLATED REGULATIONS

MATERIALS HANDLING AND STORAGE (cont.)

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 must be legibly marked on each side of the hoist. Employees should be made aware of the weight of the load.
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 inspected daily for any indication of damage and wear, and monthly records 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 not be wrapped around the load.

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FREQUENTLY VIOLATED REGULATIONS

MACHINERY AND MACHINE GUARDING

Machines designed for fixed locations must be securely anchored to prevent "walking" or tipping. 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 point of operation, in-running nip points, rotating parts, flying chips, and sparks.

Guarding devices must prevent the operator from having any part of the body in the danger zone during the operating cycle. A booklet entitled "The Principles and Techniques of Mechanical Guarding", OSHA 2057, can be obtained by writing to an OSHA Regional Office listed in the back of this book. Many equipment representatives can assist in obtaining the necessary protective devices.

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

1. Enclosing the operation (preferred)
2. Interlocking devices
3. Moving barriers
4. Removal devices
5. Remote control
6. Two-hand tripping devices
7. Electronic safety devices

THE FOUR MAIN METHODS OF GUARDING

ENCLOSURE GUARDS

Fixed enclosure guards should be used in preference to all other types. They present access to dangerous parts at all times by enclosing the hazardous operation completely. They are also used to restrain bursting machine parts from flying about. They admit the stock but will not admit hands into the danger zone because of limited feed opening size. They may be constructed so as to be adjustable to different sets of tools or dies, but once adjusted they should be fixed.

Enclosure guards may be installed at the point where material is being processed, and at other places where there may be a hazard to men inserting or manipulating stock. They may also be used to prevent contact with rotating,

MACHINERY AND MACHINE GUARDING (cont.)

reciprocating, and transverse motion of machine members away from the point-of-operation.

INTERLOCKING GUARDS

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

An interlocking enclosure guard is not fixed and may be opened or removed as the operation requires. However, due to an electrical or mechanical interlocking connection with the operating mechanism, the operation of the machine is prevented until the guard is returned to an operating position and the operator can no longer reach the point of danger.

An interlocking enclosure guard should do three things:

1. Shut off or disengage the power to prevent the starting of the machine when the guard is open.
2. Guard the danger point before the machine can be operated.
3. Keep the guard closed until the dangerous part is at rest, or stop the machine when the guard is opened.

When gate guards or hinged enclosure guards are used with interlocks, they should be so designed as to completely enclose the point-of-operation before the operating clutch can be engaged.

An interlocking barrier guard quickly stops the machine or prevents application of injurious pressure when any part of the operator's body contacts the barrier. The barrier may be a bar, a rod, a wire, or some similar device (not an enclosure), extended across the danger zone and interlocked electrically or mechanically with a braking mechanism. Electrical interlocking devices should be so designed that if they fail, they fail safe, making the guarded machine inoperative.

Another type of interlocking barrier may be in the form of an electric-eye beam, a magnetic, radiation, or similar type circuit so designed and installed that when the operator's hand or any part of the body is in the danger zone, the machine cannot be operated, or if the hand or any part of the body is inserted while the machine is in motion, it will immediately activate a braking mechanism.

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FREQUENTLY VIOLATED REGULATIONS

MACHINERY AND MACHINE GUARDING (cont.)

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 is in motion. This type of guard removes the operator's hands, arms, or body from the danger zone as the ram, plunger, or other tool closes on the piece upon which work is being done. 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 are moving barriers crossing the danger zone when the machine is activated, and pull-away devices consisting of hand and arm attachments which pull the operator away from the danger zone.

Sweep and push-away devices should be designed to prevent the operator from reaching behind or across the protective device into the danger zone before the machine has completed its closing cycle. The device itself should not offer a hazard by creating a shear point between the moving guard and a stationary or moving part of the machine.

Automatic pressure release or pivoting arm devices provide utility, yet protect in-running nip point situations.

REMOTE CONTROL, PLACEMENT, FEEDING, EJECTING

Although they are not guards in the technical sense, there are certain methods which can be used to accomplish the same effect, that is, of protecting the operator from the hazardous point-of-operation. They may be used to complement one of the other types of guards, or may be used in lieu of guards.

Two-handed operating devices may be used to activate the machine. These devices require simultaneous action of both hands of the operator on electrical switch buttons, air control valves, or mechanical levers. On presses with a non-interrupting stroke, two-handed operating devices should require manual operation until a point is reached in the cycle at which the hazard ceases. Hand controls may be interconnected with foot controls to permit operation of the machine. The actuating controls should be so located as to make it

MACHINERY AND MACHINE GUARDING (cont.)

impossible for the operator to be able to move his hands from the controls to the danger zone before the machine has completed its closing cycle. The two-handed controls should be so designed as to prevent the blocking, tying down, or holding down of one control to allow one hand free access to the point-of-operation. When more than one man is working a machine, additional controls should be installed and designed so that all men must simultaneously activate the starting mechanism from remote locations.

Automatic or semiautomatic feeding mechanisms such as roll, plunger, chute, slide and dial feeds, and revolving dies may be used in conjunction with ram enclosures. Special soft metal handtools may be used to place or remove parts in conjunction with an enclosure, interlocking or automatic guard. Special jigs, holding device, and dies may be used to manipulate stock at the point-of-operation, yet keep hands safe. Mechanical or air-operated ejecting mechanisms may be used to remove parts, thus eliminating the need for the hands to be placed in the danger zone.

The theory behind these methods is that if for good reason it is impossible to completely enclose or isolate the hazard, the next device or combination of devices should be used to keep the exposure to a minimum.

THE TECHNIQUES OF MECHANICAL GUARDING

It is recognized that a given situation—a hazard-creating motion or action—may frequently be guarded in a number of satisfactory ways. The selection of guarding method to be used may depend upon a number of things—space limitations, production methods, size of stock, frequency of use, and still other factors may be important in making the final decision. It is not the intent of this guide to suggest which method of guarding is the best for a given situation, but rather to show that there are a number of ways to guard each different condition. This will be done by illustrating typical situations which may be guarded by a variety of methods.

In the illustrations, various motions and actions are shown and typical guards illustrating the various guarding techniques. It is not possible to apply all of the guarding techniques to all of the motions or actions, but an effort has been made to show those that are frequently found in the industry.

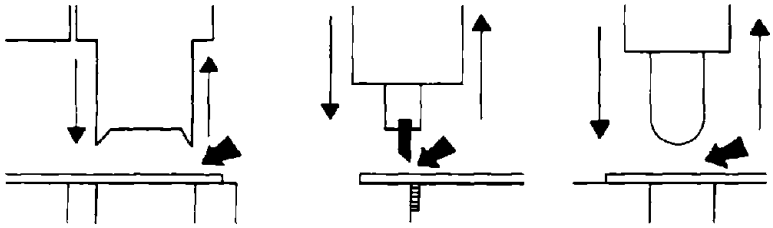
NIOSH

FREQUENTLY VIOLATED REGULATIONS

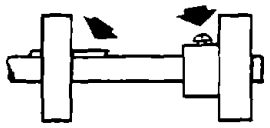
MACHINERY AND MACHINE GUARDING (cont.)

EXAMPLES OF ACTIONS AND MOTIONS REQUIRING GUARDING

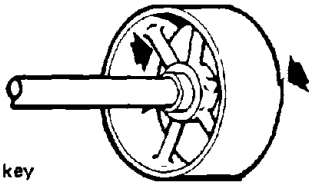
PUNCHING, SHEARING, AND BENDING



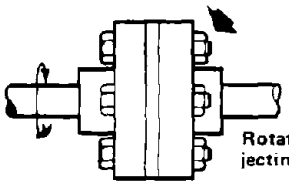
ROTATING PARTS



Rotating shaft and pulleys with projecting key and set screw

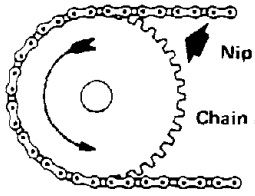


Rotating pulley with spokes and projecting burr on face of pulley



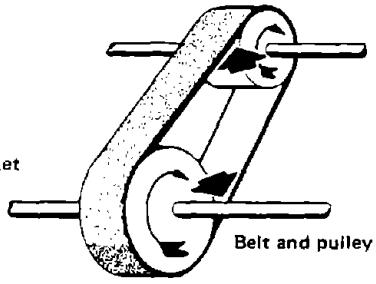
Rotating coupling with projecting bolt head

IN-RUNNING NIP POINTS

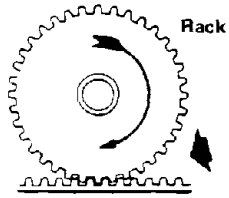


Nip Point

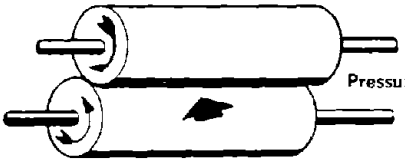
Chain and sprocket



Belt and pulley



Rack and gear



Pressure rolls

NIOSH

FREQUENTLY VIOLATED REGULATIONS

MACHINERY AND MACHINE GUARDING (cont.)

SPECIFIC EXAMPLES FOR MACHINE GUARDING

GRINDERS

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

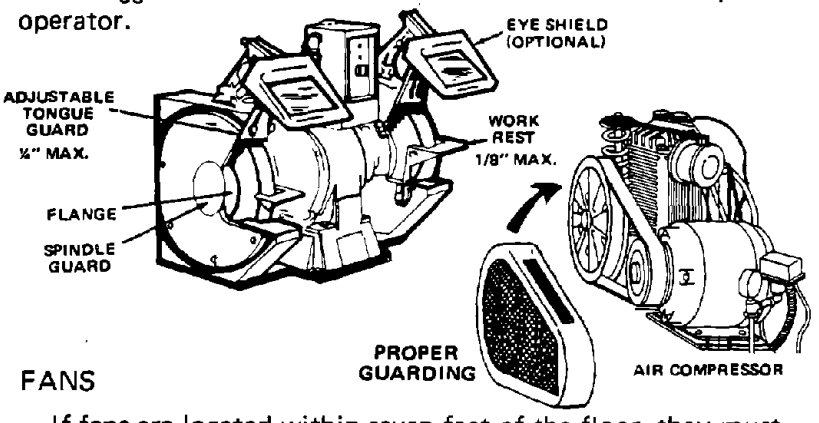
The exposed area of the grinding wheel and sides for the safety guards should not exceed more than one-fourth of the entire wheel.

When measuring the guard opening, the visors or other accessory equipment is 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 1/8 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 seven feet of the floor, they must be guarded with grille or mesh, limiting openings to not more than ½ inch.

AIR COMPRESSORS

Must have their flywheel and drive pulley fully enclosed.

NIOSH

FREQUENTLY VIOLATED REGULATIONS

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 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.

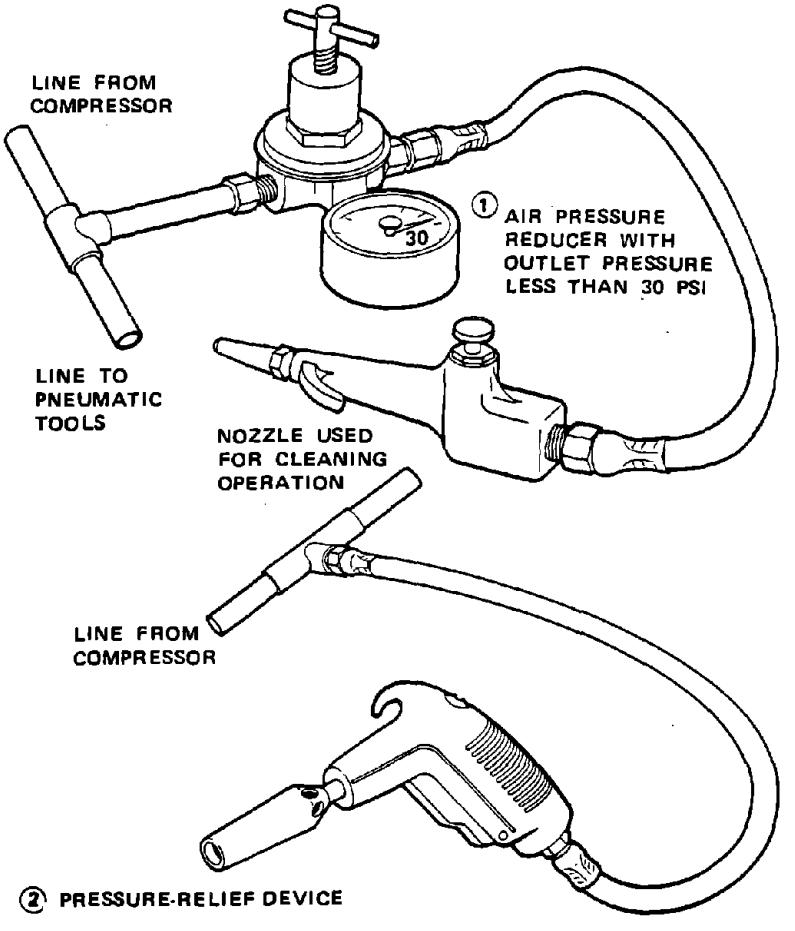
5. All hand-held portable electrical equipment must have its frame grounded or be doubly insulated and identified as such.

NIOSH

FREQUENTLY VIOLATED REGULATIONS

HAND AND PORTABLE POWERED TOOLS (cont.)

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 30 psi requirement are as illustrated below.



NIOSH

FREQUENTLY VIOLATED REGULATIONS

THE NATIONAL ELECTRICAL CODE (NEC)

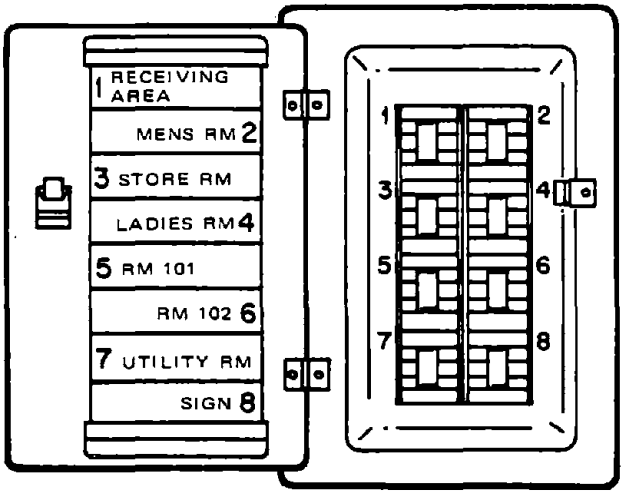
ELECTRICAL REQUIREMENTS

MORE FIRES ARE CAUSED BY ELECTRICAL MALFUNCTION THAN ANY OTHER CAUSE, and standards pertaining to electrical equipment and use in all industries have been cited as violations more frequently than any others.

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

It is required that:

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



Proper labeling of circuit breakers.

NIOSH

FREQUENTLY VIOLATED REGULATIONS

THE NATIONAL ELECTRICAL CODE (NEC) (cont.)

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:

a. In wet or damp locations.

b. If in electrical contact with metal.

c. If operated in excess of 150 volts to ground.

d. When in a hazardous location (e.g., flammable liquid storage).

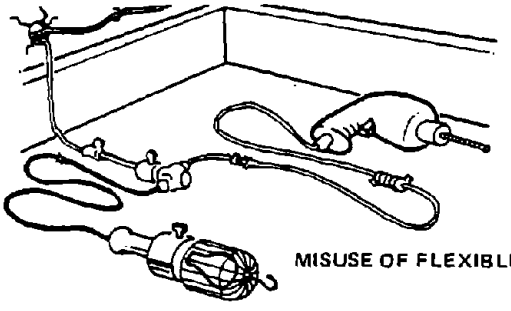
4. Exposed noncurrent-carrying metal parts of the following plug-connected equipment which are liable to become energized, must be grounded or double insulated and distinctly marked:

a. Portable hand-held motor-operated tools, or

b. Appliances, or

c. 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:

a. Used as a substitute for fixed wiring.

b. Run through holes in walls, ceilings, or floors.

c. Run through doors, windows, etc.

d. Attached to building surfaces.

7. Flexible cords must be:

a. Continuous lengths without splices or taps.

b. Fastened so that there is no pull on joints or terminal screws.

c. Replaced when frayed or when insulation has deteriorated.

NIOSH

RECORDKEEPING REQUIREMENTS

Recordkeeping requirements under OSHA are intended to compile factual information about accidents that have happened. These records provide employers with a measure for evaluating the success of their health and safety activities and of identifying high risk areas of the business to which attention should be directed. Federal regulations require that employers with 11 or more employees at any time during the previous calendar year are required to complete OSHA Forms 100, 101 (or their equivalent), and 102. These records must be maintained for five years, excluding the current year. Forms 100 and 101 must be kept current to within six days.

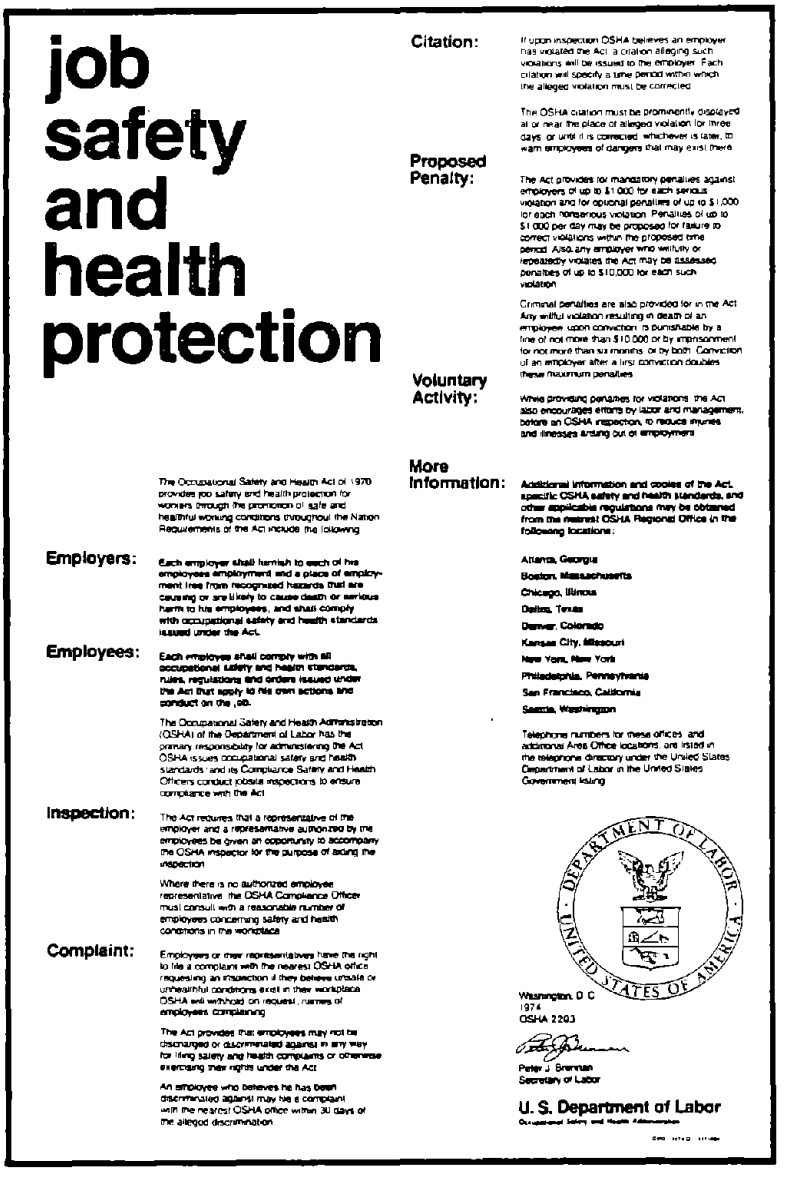
The types of work-related injuries and illnesses which must be recorded are those involving fatalities, lost workdays, or those which are nonfatal and do not cause lost workdays for the employee, but do require medical treatment, job transfer or termination, or resulted in loss of consciousness. Employers are also required to report within 48 hours to OSHA any occurrence of a work-related fatal accident or an accident requiring the hospitalization of five or more employees. An annual summary, Form 102, must be posted for the entire month of February.

Employers are required to maintain accurate records of certain potentially toxic or harmful physical agents which must be monitored or measured, and to promptly advise any employee of any excessive exposure and the corrective action undertaken.

For more detailed information, the booklet "Recordkeeping Requirements Under the Williams-Steiger Occupational Safety and Health Act of 1970" is available from OSHA.

NIOSH

RECORDKEEPING REQUIREMENTS (Cont.)



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 or the United States Government listing.

DEPARTMENT OF LABOR · UNITED STATES OF AMERICA

Washington, D.C.
1974
OSHA 2203

Peter J. Brennan
Secretary of Labor

U.S. Department of Labor

Occupational Safety and Health Administration

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

NIOSH

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 health and safety program.

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

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

Reference made in the "Checklist" subtitles refers to appropriate sections of "general industry standards, Title 29 Code of Federal Regulations Part 1910."

NIOSH

CHECKLISTS (cont.)

WALKING AND WORKING SURFACES

AISLES AND FLOOR (29 CFR 1910.22)

	Yes	No
Are all places of employment kept clean and orderly?	☐	☐
Are floors, aisles, and passageways kept clean and dry and all spills cleaned up immediately?	☐	☐
Are floor holes, such as drains, covered?	☐	☐
Are permanent aisles appropriately marked?	☐	☐
Are wet surface areas covered with non-slip materials?	☐	☐

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

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

STAIRS (29 CFR 1910.24)

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

NIOSH

CHECKLISTS (cont.)

	Yes	No
Do stairs have at least a seven-foot overhead clearance?	☐	☐
Do stairs angle no more than 50° and no less than 30°?	☐	☐
LADDERS (29 CFR 1910.25, .26, .27)		
Have defective ladders (e.g., 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 seven inches or more?	☐	☐
Do all fixed ladders have a preferred pitch of 75°-90°?	☐	☐
EGRESS (29 CFR 1910.36-.37)		
Are all exits marked with an exit sign and illuminated by a reliable light source?	☐	☐
Is the lettering at least six inches high with the principle letter strokes at least ¾ of an inch wide?	☐	☐
Is the direction to exits, when not immediately apparent, marked with visible signs?	☐	☐

NIOSH

CHECKLISTS (cont.)

	Yes	No
Are doors or other passageways, that are neither exits nor access to an exit, and located where they may be mistaken for exits, appropriately marked "NOT AN EXIT", "TO BASEMENT", "STOREROOM", etc.?	☐	☐
Are exit doors side-hinged?	☐	☐
Are all doors that must be passed through to reach an exit or way to an exit, always free to access with no possibility of a person being locked inside?	☐	☐
Are all exit routes always kept free of obstructions?	☐	☐
OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL (29 CFR 1910.93, .94, .95)		
Is management aware of the hazards caused by various materials used in the plant?	☐	☐
Is employee exposure to these chemicals kept within the acceptable levels?	☐	☐
Are eye wash fountains and safety showers provided in areas where chemicals, such as caustics, are used?	☐	☐
Are all containers, such as vats, storage tanks, etc. labeled as to their contents?	☐	☐
Is vacuuming used wherever possible rather than blowing or sweeping dust?	☐	☐

NIOSH

CHECKLISTS (cont.)

	Yes	No
If asbestos is used as an extender or filler:		
Have employee exposures been determined?	☐	☐
Are exposed employees given annual physical examinations?	☐	☐
Are employees required to wear personal protective equipment when handling solvents, resins, pigments, etc. to avoid eye or skin contact?	☐	☐
OCCUPATIONAL NOISE EXPOSURE (29 CFR 1910.95)		
If a noise problem is suspected, have noise 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?	☐	☐

NIOSH

CHECKLISTS (cont.)

	Yes	No
HAZARDOUS MATERIALS		
FLAMMABLE AND COMBUSTIBLE LIQUIDS (29 CFR 1910.106)		
Are all connections on drums and combustible liquid piping systems vapor and liquid tight?	☐	☐
Are flammable liquids kept in closed containers when not in use (e.g., parts cleaning tanks, pans, etc.)?	☐	☐
Are all spills of flammable or combustible liquids cleaned up promptly?	☐	☐
Is combustible waste material (oily rags, etc.) stored in covered metal receptacles and disposed of daily?	☐	☐
Are bulk drums of flammable liquids grounded and bonded to containers during dispensing?	☐	☐
Are gasoline and other flammable liquids stored in approved containers?	☐	☐
Do storage rooms for flammable and combustible liquids have 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 liquids labeled "FLAMMABLE—KEEP FIRE AWAY"?	☐	☐

NIOSH

CHECKLISTS (cont.)

	Yes	No
Are storage areas for flammables prominently posted as a "NO SMOKING" area?	☐	☐
Is the ventilation rate across the face of the paint spray booth at least 100 linear feet per minute?	☐	☐
Are spray booth lights explosion proof?	☐	☐
UNDERGROUND STORAGE TANKS		
Does the vent pipe extend at least 12 feet above grade?	☐	☐
Is the vent pipe located so vapors do not discharge inside buildings or become trapped under eaves, etc.?	☐	☐
PERSONAL PROTECTIVE EQUIPMENT (29 CFR 1910.132-.137)		
Is personal protective equipment provided, used, and maintained wherever it is necessary?	☐	☐
Is employee-owned personal protective equipment, such as gloves, protective shoes, etc., adequate and properly maintained?	☐	☐

NIOSH

CHECKLISTS (cont.)

	Yes	No
Is eye protection available where debris or flying objects could be a hazard?	☐	☐
Are ear plugs or muffs provided and worn during noisy conditions?	☐	☐
Is slip-resistant footwear worn?	☐	☐
Are hard hats or safety shoes available where falling objects could be a hazard?	☐	☐
RESPIRATORY PROTECTION DEVICES (29 CFR 1910.134)		
Are respirators provided when and where 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?	☐	☐

NIOSH

CHECKLISTS (cont.)

	Yes	No
GENERAL ENVIRONMENTAL CONTROLS		
SANITATION (29 CFR 1910.141-.149)		
Are restrooms and washrooms kept in clean and sanitary condition?	☐	☐
Are covered receptacles for waste food kept in clean and sanitary condition?	☐	☐
Are covered receptacles for sanitary napkins provided in the women's restroom?	☐	☐
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 COOKING"?	☐	☐
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)		
Are first aid supplies readily available, inspected, and replenished?	☐	☐

NIOSH

CHECKLISTS (cont.)

	Yes	No
Is at least one employee on each shift currently qualified to render first aid in the absence of a nearby clinic or hospital? (Some states require first aid trained persons regardless of nearby clinics or hospitals.)	☐	☐
Are first aid supplies approved by a consulting physician, indicating that they are adequate?	☐	☐
Are medical personnel readily available for advice and consultation on matters of employee health?	☐	☐
Is there a first aid kit easily accessible to the work area?	☐	☐
Are emergency phone numbers posted?	☐	☐
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-.161)		
Are the extinguishers selected for the types of combustibles and flammables in the areas where they are to be used? Class A. Ordinary combustible material fires Class B. Flammable-liquid or grease fires Class C. Energized-electrical-equipment fires	☐	☐
Are extinguishers fully charged and in designated places?	☐	☐

NIOSH

CHECKLISTS (cont.)

	Yes	No
Are extinguishers located along normal paths of travel?	☐	☐
Are extinguisher locations free from obstruction or blockage?	☐	☐
Are extinguishers not mounted too high? If not exceeding 40 pounds, the top must not be higher than five feet above floor; greater than 40 pounds, the top must not be higher than 3½ feet above floor.	☐	☐
Have all extinguishers been serviced, maintained, and tagged at intervals not to exceed one 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.?	☐	☐
AUTOMATIC SPRINKLER (if applicable)		
Is there at least one automatic water supply of adequate pressure, capacity, and reliability?	☐	☐
Is combustible material never piled within 36 inches of the sprinkler system except as mentioned below? 1. Solid piles 15 feet high or in piles 12 feet high with horizontal channels. 2. Commodities containing only small amounts of combustible material.	☐	☐
Is the storage of material, mentioned in No's. 1 and 2 above, never piled next to lights or within 18 inches of the sprinkler system?	☐	☐

NIOSH

CHECKLISTS (cont.)

	Yes	No
Are water-flow alarms provided on all sprinklers?	☐	☐
Are the sprinkler systems periodically inspected and continuously maintained?	☐	☐
DRY CHEMICAL SYSTEMS (if applicable)		
Does a competent inspector make annual inspections and perform tests on all dry chemical systems?	☐	☐
Are the inspector's reports kept on file?	☐	☐
Are visual inspections regularly made?	☐	☐
Are all dry chemical systems maintained in full operating condition at all times?	☐	☐
COMPRESSED AIR (29 CFR 1910.169)		
Are pulleys and belts on compressors and motors completely guarded?	☐	☐
Are flexible cords or plugs on electric motors periodically checked and replaced if in a deteriorated condition?	☐	☐
Do the relief valves operate properly?	☐	☐
Are air tanks drained regularly?	☐	☐
Is the pressure-relief device and gauge in good operating condition?	☐	☐

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CHECKLISTS (cont.)

MATERIALS HANDLING AND STORAGE (29 CFR 1910.176-.181)	Yes	No
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 industrial 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 all vehicles shut off prior to loading?	☐	☐
Are dock boards (bridge plates) used when loading or unloading from dock to truck or dock to rail car?	☐	☐
Is all storage secured against sliding or collapsing?	☐	☐
Have aisles been designated and kept clear to allow unhindered passage?	☐	☐
Are containers of combustibles or flammables, when stacked one upon the other, always separated by dunnage sufficient to provide stability?	☐	☐

NIOSH

CHECKLISTS (cont.)

	Yes	No
Are racks and platforms loaded within the limits of their capacity?	☐	☐
If motorized equipment, such as lift trucks, is used, are aisles permanently marked, providing sufficient clearance for passage of the equipment?	☐	☐
Are specifications posted for maximum loads which are approved for floors (except slabs with no basements), roof of a building, or some other structure?	☐	☐
MACHINE AND MACHINE GUARDING (29 CFR 1910.212)		
Are belts, pulleys, and rotating shafts (air compressor, drill presses, etc.) properly guarded?	☐	☐
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 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 seven feet from the floor completely enclosed?	☐	☐

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CHECKLISTS (cont.)

Are fans less than seven feet above floor guarded, having openings ½ inch or less? ☐ ☐

ABRASIVE WHEEL MACHINERY (Grinders) (29 CFR 1910.215)

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

Is the adjustable tongue on top side of grinder used and kept adjusted to within ¼ inch of wheel? ☐ ☐

Do side guards cover the spindle, nut, and flange and 75% of the wheel diameter? ☐ ☐

Are bench and pedestal grinders permanently mounted? ☐ ☐

Are goggles or face shields always worn when grinding? ☐ ☐

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

Are tools and equipment (both company and employee-owned) in good condition? ☐ ☐

Have 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? ☐ ☐

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CHECKLISTS (cont.)

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

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?	☐	☐
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?	☐	☐

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CHECKLISTS (cont.)

Do flexible cords and cables not run through holes in wall or ceiling or through doorways or windows?	☐	☐
Are flexible cords and cables free from splices or taps?	☐	☐
Does all equipment connected by cord and plug have grounded connections?	☐	☐
Are electrical appliances such as vacuums, polishers, vending machines, etc. grounded?	☐	☐
Are all portable electrical hand tools grounded? (Doubly insulated tools are acceptable without grounding.)	☐	☐
Are breaker switches identified as to their use?	☐	☐

RECORDKEEPING (29 CFR 1904.2-.8)

Is employee poster (OSHA or equivalent state poster) prominently displayed?	☐	☐
Has a summary of all occupational injuries and illnesses been compiled at the conclusion of each calender 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 five years, excluding the current year?	☐	☐
Have occupational injuries or illnesses, except minor injuries requiring only first aid, been recorded on OSHA Form Nos. 100 and 101, or equivalent?	☐	☐

NIOSH

INFORMATION SOURCES

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

- ☐ A12.1 Floor and Wall Openings
- ☐ A58.1 Minimum Design Load
- ☐ B15.1 Mechanical Power Transmission
- ☐ B31.1 Pressure Piping-Power Piping
- ☐ C1 National Electric Code
- ☐ S21.3 Gas Appliances and Gas Piping
- ☐ Z4.1 Sanitation in Places of Employment
- ☐ Z9.2 Local Exhaust Systems

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

- ☐ NFPA-10-1970 Installation of Portable Fire Extinguishers
- ☐ NFPA-101-1970 Life Safety Code
- ☐ NFPA-70-1971 National Electric Code

NATIONAL SAFETY COUNCIL
425 North Michigan Avenue
Chicago, Illinois 60611

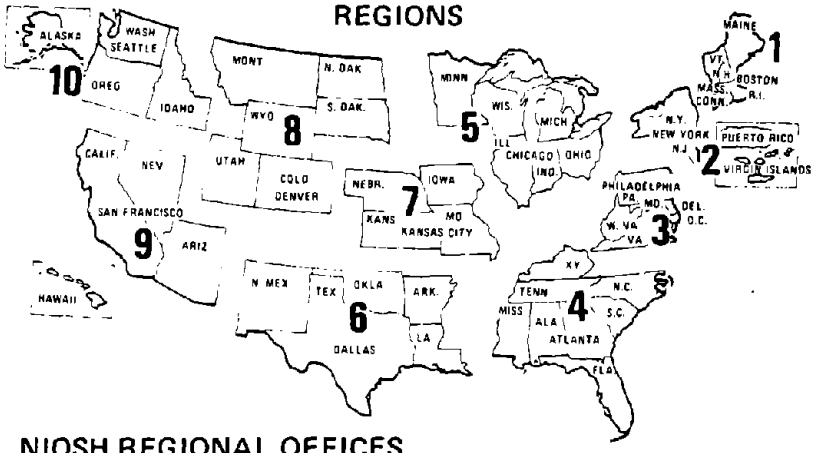
NIOSH Certified Personal Protective Equipment
Pub. No. 75-119
Office of Technical Publications
NIOSH
Post Office Building
Cincinnati, Ohio 45202

NIOSH AND OSHA REGIONAL DIRECTORS

Trade associations and insurance comapnies can also provide useful information. The Small Business Administration will provide information concerning procedures for securing economic assistance on compliance with the OSHA Standards (if needed).

NIOSH AND OSHA REGIONAL OFFICES

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



NIOSH REGIONAL OFFICES

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

DHEW, Region II—Federal Building
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.: 404/526-5474

DHEW, Region V
300 South Wacker Drive
Chicago, Illinois 60607
Tel.: 312/353-1710

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

Region I
U.S. Department of Labor
Occupational Safety and Health Administration
18 Oliver Street, Fifth Floor
Boston, Massachusetts 02110 . . . . . Telephone: 617/223-6712/3

Region II
U.S. Department of Labor
Occupational Safety and Health Administration
1515 Broadway (1 Astor Plaza)
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 Street
Chicago, Illinois 60604 . . . . . Telephone: 312/353-4716/7

Region VI
U.S. Department of Labor
Occupational Safety and Health Administration
7th Floor, Texaco Building, 1512 Commerce Street
Dallas, Texas 75210. . . . . 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
1808 Smith Tower Building, 506 Second Avenue
Seattle, Washington 98104 . . . . . Telephone: 206/442-5930

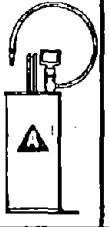
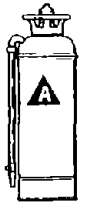
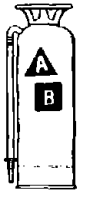
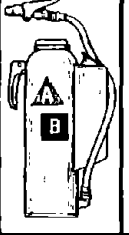
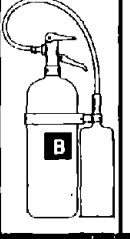
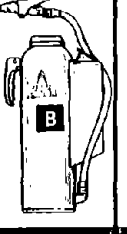
KIND OF FIRE

DECIDE THE CLASS OF FIRE YOU ARE FIGHTING. . .

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

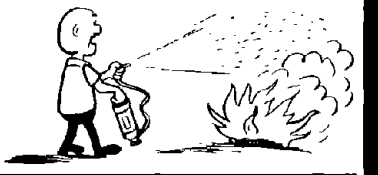
APPROVED TYPE OF EXTINGUISHER

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.		X					X
CLASS B FIRES — USE THESE EXTINGUISHERS — FLAMMABLE LIQUIDS, GREASE • GASOLINE • PAINTS • OILS, ETC.			X	X	X		
CLASS C FIRES — USE THESE EXTINGUISHERS — ELECTRICAL EQUIPMENT • MOTORS • SWITCHES ETC.	X		X	X	X		

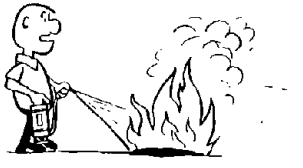
HOW TO OPERATE

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

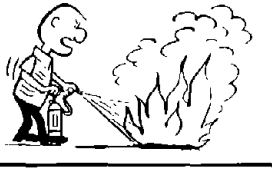


CARBON DIOXIDE: Direct Discharge as Close to Fire as Possible. First at Edge of Flames and Gradually Forward and Upward

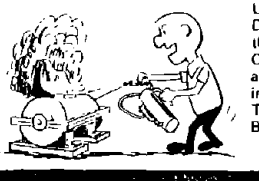
SODA-ACID, GAS CARTRIDGE: Direct Stream at Base of Flame



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



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



NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

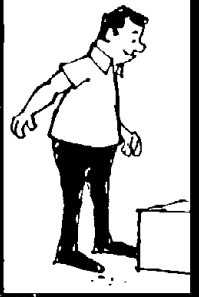
HOW TO LIFT SAFELY

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

The factors that contribute to safe lifting are...

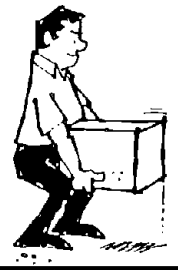
1. Approach the load and size it up (weight, size and shape.)
Consider your physcial ability to handle the load

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

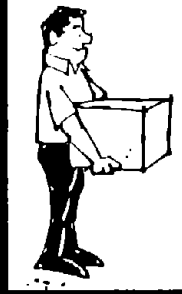


3. Bend the knees to the degree that is comfortable and get a good handhold Then using both leg and back muscles. . . .

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



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

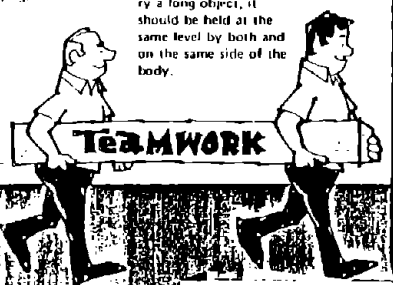


6. Turn your body with changes of foot position after looking over your path of travel making sure it is clear.

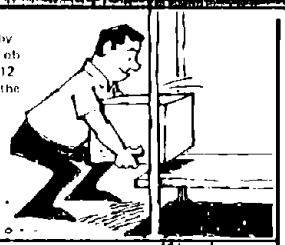
7. Setting the load down, is just as important as picking it up. Using leg and back muscles, comfortably lower load by bending your knees. When load is securely positioned, release your grip.

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

When lifting and carrying with another person—teamwork is important.
The load should be equally distributed Movements must be coordinated so you both start and finish the lift action at the same time and perform turning movements together.
When two persons carry a long object, it should be held at the same level by both and on the same side of the body.

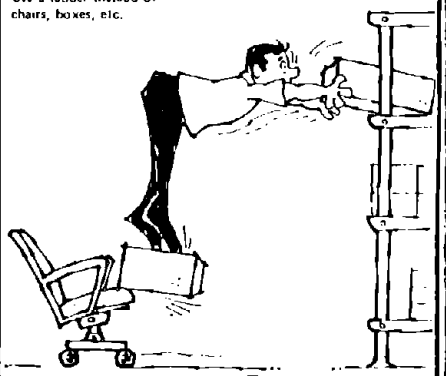


Avoid strain by storing heavy objects at least 12 inches above the floor.



Avoid awkward positions or twisting movements while lifting

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



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