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**HEALTH AND SAFETY GUIDE FOR
CONCRETE PRODUCTS INDUSTRY**

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

The Williams-Steiger "Occupational Safety and Health Act of 1970" was passed into law "to assure safe and healthful working conditions for working men and women. . ." This Act established the National Institute for Occupational Safety and Health (NIOSH) 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

GENERAL PHILOSOPHY FOR HEALTH AND SAFETY COMPLIANCE

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

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

When new buildings are being constructed, renovations are being made, or new equipment is obtained, the standards must be followed.

Even where a citation is issued, it is desirable that the employer have demonstrated his willingness to comply with the intent of the law by operating effective, on-going safety and health programs, by correcting imminent dangers in the workplace, by maintaining records of purchases, installations, and other compliance-promoting activities. Therefore, after an OSHA compliance visit and a citation, the manager can substantiate his intent to provide a safe and healthy workplace for his employees by demonstrating records which document his purpose, and may be given the benefit of having shown "good faith" when penalties are being determined.

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HEALTH AND SAFETY GUIDELINES (cont.)

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.



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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 leadership is necessary to ensure success

Management may want to assign health and safety responsibilities in the areas of both program development and implementation. Regular meetings or informal discussions 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 supervisor, must be delegated the authority and have management support to carry out the part of the program assigned. Likewise, everyone in the establishment should be aware of the activities of the program through a systematic interchange of information. Employees cannot take an interest in the program if they are unaware of what is occurring. Conversely, well informed employees will likely show interest and a desire to participate.

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HEALTH AND SAFETY GUIDELINES (cont.)

REDUCING UNSAFE ACTS AND PRACTICES

EMPLOYEE TRAINING

A safe operation depends largely 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, and preferably more persons, 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 instruction 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.)

MACHINE GUARDING

It is generally recognized that machine guarding is of the utmost importance in protecting the employee. In fact, it could be said that the degree to which machines are guarded in an establishment is a reflection of management's interest in providing a safe workplace.

Personnel cannot always be relied upon to act safely enough around machinery in motion to avoid accidents. From time to time, people will react differently to the same environment because of physical, mental, or emotional changes—sometimes reacting safely, sometimes not. It follows that even the well-coordinated and highly trained individual may at times perform unsafe acts which could lead to injury and death. Therefore, while concrete products manufacturing share many of the same hazards to be found in other workplaces, those presented by operating machines have a high potential for severe injury.

Proper guarding will allow the worker to work safely and at the same time perform his assigned tasks.

Hazards are created wherever there are rotating, reciprocating, and transverse motions; in-running nip points; cutting, punching, shearing, and bending actions. Some of these motions may be at the point of operation (point where work is performed upon the material in process) or other moving parts of the machine.

It is not adequate to consider the safety of the machine operator only, but others in the machine area must be safeguarded.

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL

In the occupational environment, persons may be exposed to excessive levels of a variety of harmful materials, including gases, dusts, mists, vapors, fumes, certain liquids and solids, noise, heat, cold, and so forth.

Often health hazards are not recognized because materials used are identified only by trade names; a further complication arises from the fact that materials tend to contain mixtures of substances, making identification still more difficult.

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To begin identifying occupational health hazards, a materials analysis (product inventory) is made and all hazardous substances listed and evaluated. If the composition of a material cannot be determined, the information should be requested from the manufacturer or supplier who often will provide **Material Safety Data Sheets** for his products. These Sheets may contain health and safety information about materials, such as signs and symptoms of over-exposure, physical characteristics, and incompatibilities with other substances.

A process analysis is now performed noting all chemicals used and all products and by-products formed. When doing such an analysis, allied activities such as maintenance and service operations should be included. Examples of specifics to watch for are:

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

It should be noted that skin conditions, such as chemical burns, skin rashes, dermatitis, etc., constitute over half of all occupational health problems. The use of protective creams or lotions, proper personal protective clothing and other protective equipment, and the practice of good personal hygiene can often prevent these problems.

Various control methods can be used to prevent or reduce employee exposure. They are as follows:

1. Substitution of less toxic materials for more toxic ones—if toxic substances must be used.
2. Change of a process—a change from gas-operated fork lift trucks to electric lift trucks.
3. Isolation—placing the hazardous process in a separate room or in a corner of the building to reduce the number of persons exposed.
4. Administrative controls—limiting the total amount of time an individual is exposed to a health hazard by daily

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rotating the person to work operations where the hazard is not present.

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

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

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

8. Ventilation—includes either local exhaust ventilation, by which contamination is removed at the point of generation, or general mechanical ventilation.

High level noise exposure is often a concern in metal stamping operations. The noise source is usually the presses, but it can also originate from such operations as tumbling, grinding, chipping, and other metal processes.

To control excessive noise, it is advantageous to start the controls at the source—isolation of either the source or exposed persons. Proper maintenance and adjustment often reduces noise to acceptable levels. When isolation or maintenance fails to achieve the desired ends, then engineering or other controls may be needed. Ear protectors (ear muffs, ear plugs) are only temporary measures while implementing other controls.

AUTOMATIC SPRINKLER SYSTEMS

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

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

2. One or more fire department connections through which the fire department can pump water is required. No shut-off

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valve is allowed in this connection.

3. The employer is responsible for the condition of the sprinkler system and must keep it in good operating order. At least annual functional tests are required.

4. The clearance between sprinkler deflectors and the top of combustible storage must be at least 36 inches unless the material is in solid piles less than 15 feet high or in piles less than 12 feet high with horizontal channels, in which case a minimum clearance of 18 inches is allowed. Commodities containing only small amounts of combustible material may be stored up to 18 inches from the sprinkler deflectors.

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

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ABOUT THE INDUSTRY

MATERIAL BATCHING AND MIXING

Activities in the batching and mixing areas can present health as well as safety hazards. Of particular importance is the potential for respiratory, eye, and skin irritation. Dust, and in particular cement dust, is always present and easily inhaled. Inhalation of cement dust can cause irritation as well as acute and chronic ailments of the respiratory system.

Sand and gravel are an ever-present source of eye irritation. However, cement is a worse problem because it is more injurious to the eyes and more irritating to the skin. Also, exposure to additives used in batching, such as accelerators, water reducing agents, antifreeze, and other air contaminants, must be minimized. Containers of these materials usually have caution or warning labels which must be observed. Generally, flushing the affected area with water is the first step to alleviating discomfort following accidental exposure.

It is important to remember that wet concrete is toxic, abrasive, and caustic. Because of the danger of splatter, especially splatter to the eyes (or face), and skin, protection should be provided the employee. Goggles (or face masks), gloves, rubber shoes, and other protective clothing are examples of protective clothing and equipment which should be provided.

Silos can pose a serious safety hazard. Access to the tops of silos is by ladder or crossover walkways. Open top silos require guarding.

Materials often become bonded in wet or freezing weather and "hang up". When this situation occurs, the material may often be manually loosened. Persons can accidentally fall into a silo under such circumstances. If the silo is filled with cement, which behaves like quicksand, a person can sink below the surface very quickly. Safety belts and lifelines are needed where there is danger of falling into silos.

LOCKOUT AND TAGGING OF CIRCUITS

All machinery which is being worked on should be shut down and properly locked out. Never clean, maintain, or adjust any machinery in motion. Unless this procedure is

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followed strictly, accidental restarting of the machinery by another person is possible. To the unsuspecting worker, this could result in fatal shocks, serious burns, or injury of hands, limbs, or other parts of the body.

Experience has shown that the only workable method of protecting repairmen from machine accidents is to lock the main machine power source in the OFF position. Some equipment is manufactured with built-in key-locking devices. Where such built-in locks are not installed, individual locks and DANGER tags should be used, with each worker responsible for placing and removing their own lock and tag. This method, however, must be used in accordance with a strictly enforced tag and lockout procedure.

CONCRETE PLACEMENT

1. Buckets

A loaded bucket must not exceed the lifting capacity of a crane.

A safe platform (i.e., a nonslip surface with a standard railing, if above ground level) should be provided for employees to work from when manually pouring concrete from an open bucket.

An operable locking device must be used on bucket gates.

Buckets may not be transported over the heads of persons working below.

A communication system, which could be vocal or visual should be set up before transfer of concrete begins.

Powered trucks used to transport buckets must have a horn and back up alarms. Special mirrors to help eliminate blind spots are also helpful in preventing accidents.

2. Personnel

It is unsafe for persons to ride buckets.

Personal protective equipment such as safety glasses, rubber boots, and gloves must be worn when washing out buckets.

3. Ready Mix Trucks

At the loading area, trucks should travel a predetermined fixed route. If possible, the trucks should travel forward at all times; backing should be kept to a minimum.

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A signal person should be available to assure safe entry and exit to the loading area.

Safe hand tools, such as shovels, hoes, etc. must be provided and maintained in good repair.

When loading concrete on a slope, the wheels of the ready-mix truck should be chocked and the brakes set.

Backing lanes must be free of equipment, material, and workers.

The movement of personnel and equipment should be routed so as to avoid crossing the truck lane.

METAL FABRICATION

General Requirements:

Metal fabrication is an integral part of the industry. The dangers involved in working in and around a metal fabrication area must be emphasized. For information about this topic, the reader is referred to the sections on "Portable Hand Tools", "Welding, Cutting, and Brazing", and "Machinery and Machine Guarding" sections of this guide.

Considerations During Tensioning:

Tensioning requires great care by all who are involved. The energy stored in stressed strands, bars, or tendons can cause serious physical harm if accidentally released. Written procedures should be established which outline the actions of each crew member and identify hazardous operations.

The location and position of stressing beds deserve important consideration in the overall plant layout. The beds should be laid out so that employees will pass the ends of the beds as infrequently as possible. Since it may be impossible to eliminate all traffic around the beds, shields should be installed at the ends of the beds to stop flying strands and strand chucks resulting from strand breakage.

Another important consideration is the handling and storage of stressing materials (strands, bars, tendons, etc.). Procedures should be implemented which will prevent cutting, pinching, or burning of these materials in transportation and storage. What appears to be minor imperfections may cause serious accidents when they are put under stress.

Before each tensioning operation, the crew should run the equipment through its cycle without strands in place. The

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cutoff valves and level of hydraulic fluid should be checked to make sure the equipment is functioning properly.

The warning signals should be checked to be certain they are in working order before stressing begins. Work should not proceed until warning signals are working properly.

CONVEYOR SYSTEMS

General Requirements:

All exposed gears, pulleys, and shafts must be properly guarded.

All personnel exposed to concrete splatter must wear eye protection.

The operator's station must have means for stopping the motor or engine. If the operator does not have full view, the conveyor systems must be equipped with an audible warning signal to be sounded immediately before starting the conveyor.

If the operator's station is at a remote point, similar provisions for stopping the motor or engine at the motor or engine location apply.

Emergency stop switches are to be arranged so that the conveyor cannot be started again until the actuating stop switch has been reset to the "running" or "on" position.

Screw conveyors must be guarded to prevent employee contact with the turning screw.

Where a conveyor passes over work areas, aisles, or thoroughfares, suitable guards must be provided to protect employees working below the conveyors.

All crossovers, aisles, and passageways must be conspicuously marked by proper warning signs.

Conveyors must be locked out or otherwise rendered inoperable, and labeled with a "DO NOT OPERATE" tag during repairs and cleaning when the operation is hazardous to employees performing maintenance work.

Consolidation:

1. Internal Vibration

The handles of all electric hand vibrators must be of non-conductive material.

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HEALTH AND SAFETY GUIDELINES (cont.)

A safety-relief valve must be installed at the source of pressure on all air-operated vibrators.

Employees using electric vibrators should wear rubber gloves and rubber boots and the vibrators must be grounded.

Employees using any internal vibrator must wear eye protection.

2. External Vibration

External vibration causes a noise hazard (see "Occupational Noise Exposure" section).

STEEL PLACEMENT

Placement of reinforcing steel is a prime factor in concrete construction. Accurate placement assures adequate utilization of the structure. Likewise, careful placement protects the workers involved. The fabrication of reinforced concrete requires care by the personnel involved. Proper protective equipment should be used for all procedures (e.g., face and eye protection should be worn when using cutting tools, grinders or when welding).

STEAM CURING

All steam supply headers and return lines should be insulated if they are within seven feet of the floor or a working platform.

Steam lines on or under forms should be located in such a position as to prevent workers from touching them.

The steam supply to the form or bed must always be cut off before uncovering. After cut-off the steam is allowed to dissipate and the covers may be removed.

If possible, steam supply lines should be turned off at the boiler during the day to prevent a valve from accidentally being turned on.

Proper personal protective equipment such as asbestos gloves and long sleeved clothing must be used when working with hot steam lines.

BOILERS

State and local laws require periodic inspections. Boiler equipment is usually not inspected by company employees,

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HEALTH AND SAFETY GUIDELINES (cont.)

but rather by a boiler inspector certified by the authority having jurisdiction. A prearranged schedule of inspections should be followed, as required by law.

Most states require thorough and current annual inspection of boilers. The inspector's certificate (or a copy) for a boiler should be placed on or near it.

The keeping of a boiler log should be enforced to insure that necessary tests, maintenance, and services are performed, and that records are available at all times.

OUTSIDE STORAGE

General Recommendations:

1. All lighting and power supply lines to outside storage areas should be installed underground.
2. The storage area should be inspected after hard rains for washouts.
3. Stacked materials should be separated by sound timbers (dunnage) placed across the material at the bearing points.
4. Adequate walkways and vehicle aisles must be provided and designated.
5. Storage racks needed for storing products must be adequately designed and constructed to prevent failure.
6. Protruding strands and prestressed products should be cut from the product when it is placed in storage, otherwise the protrusion should be well marked or protected to prevent injuries.

DUST

The dustiest areas of a concrete products manufacturing operation are normally in the batching and mixing areas.

Employee exposure to air contaminants must be controlled as completely as possible by the use of engineering controls or by limiting the time of exposure. If these controls fail to produce satisfactory results, personal protective equipment or other protective measures must be utilized to control employee exposures. (A single-use dust mask or a unit with replaceable filters or cartridges made for this purpose, is suitable).

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1. Good housekeeping will help reduce the dust problem by reducing the potential for resuspension. However, a technique, such as vacuuming, should be used that will not itself create a dust problem.
2. Increased ventilation in specific areas.

ACIDS

Various types of acids, most notably hydrochloric or muriatic acid, are commonly used in the concrete industry. They can be handled safely if the proper procedures and personal protective devices are used.

1. Acids should be stored away from combustible materials in air tight, properly labelled containers, out of aisles and heavy traffic areas.
2. Some acids splatter or emit vapors when water is mixed with them. Splatter can cause acid burns when acid gets on the skin, in the eyes, or on clothing. To reduce splatter, employees must be instructed in proper mixing procedures. One important instruction is always add acid to the water; never add water to the acid.
3. Before handling, all containers must be inspected for damage, leaks, bulging, and loose plugs.
4. Goggles or a face shield (or both), head protection, acid proof, full-gauntlet gloves, apron, and acid-proof boots may be necessary when handling acids. Sleeves and pant legs should always be worn outside of gloves and boots.
5. A deluge shower or other facilities for rapidly flushing the entire body should be in the immediate vicinity. An eye-wash fountain or hose must be available and operating properly.

OIL MIST

Oil or kerosene is frequently applied to forms to facilitate release of the finished product from the form. In most cases, these materials are sprayed as an aerosol. Several hazards may result from this practice if it is not carefully controlled.

1. The atomized oil mist creates a serious explosion hazard. All welding, open flames and ungrounded electrical equipment should be kept clear of the area.

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2. A health hazard may result from breathing excessive concentrations of the oil or kerosene mists. Adequate ventilation should be provided and respirators should be available.

3. A slipping hazard is always created when oil is used. Employees should not be allowed to walk on oiled forms and should be required to wear shoes with nonslip soles.

ASBESTOS

Asbestos is sometimes added to concrete for acid-resistance or other properties. Asbestos dust when inhaled can cause serious bodily harm and incurable disease (pulmonary fibrosis and cancer).

The following procedures are important:

1. Asbestos dust producing procedures must be isolated and the dust should be vented away from employees.

2. Asbestos should be wetted before handling to reduce airborne fibers.

3. Asbestos waste and debris should be collected in impermeable bags and containers.

4. Bags of asbestos and asbestos-bearing materials must be labelled.

5. A respirator approved for the purpose is usually required when handling asbestos. (Replaceable cartridge respirators, a single-use mask, a self-contained breathing apparatus or a supplied air device are suitable for this purpose).

6. Clothes should be vacuumed after work periods and placed in a designated container. Separate change rooms must be used if employees are exposed to air concentrations in excess of the OSHA standard.

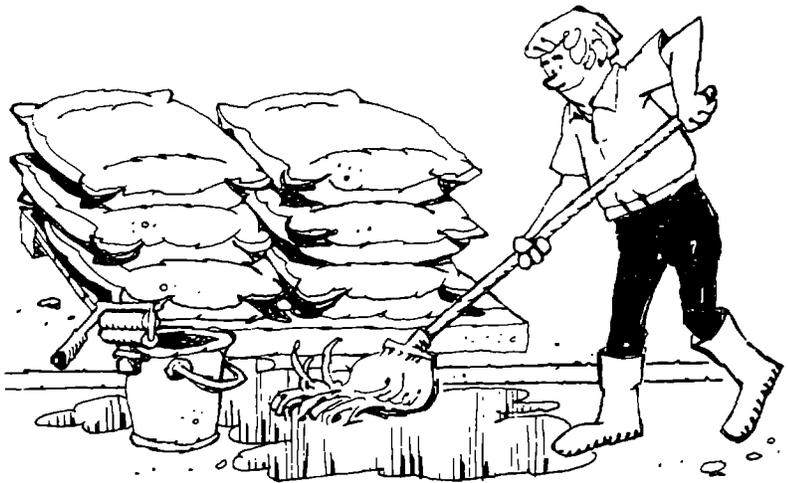
7. Smoking should be controlled. Asbestos workers who smoke while working run a greater risk of respiratory disease than non-smoking workers.

8. Regular physical examinations should be provided for all employees handling asbestos.

9. Where asbestos is used, cleaning must be done by vacuuming.

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FREQUENTLY VIOLATED REGULATIONS WALKING AND WORKING SURFACES



GENERAL REQUIREMENTS

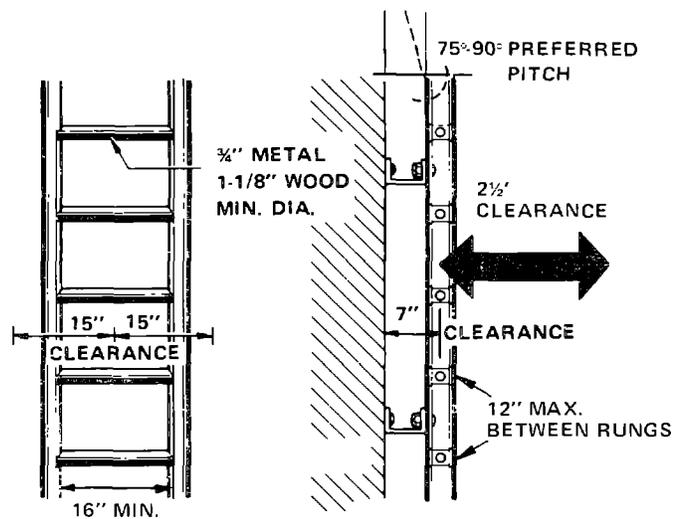
1. The workplace must be maintained clean, orderly, sanitary, and as far as possible, in a dry condition. Spills should be cleaned up promptly.
2. Areas which are constantly wet should have nonslip surfaces where personnel normally walk or work.
3. Every floor, working place, and passageway must be maintained 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 $\frac{3}{4}$ inch for metal ladders, or $1\frac{1}{8}$ 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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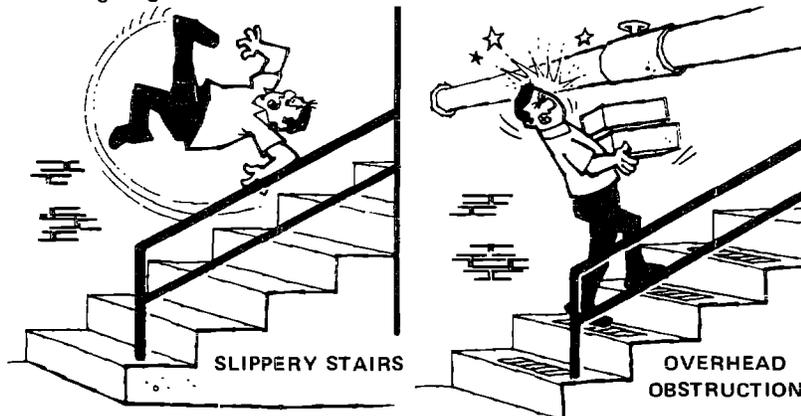
FREQUENTLY VIOLATED REGULATIONS WALKING AND WORKING SURFACES (cont.)

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.



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

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FREQUENTLY VIOLATED REGULATIONS 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:

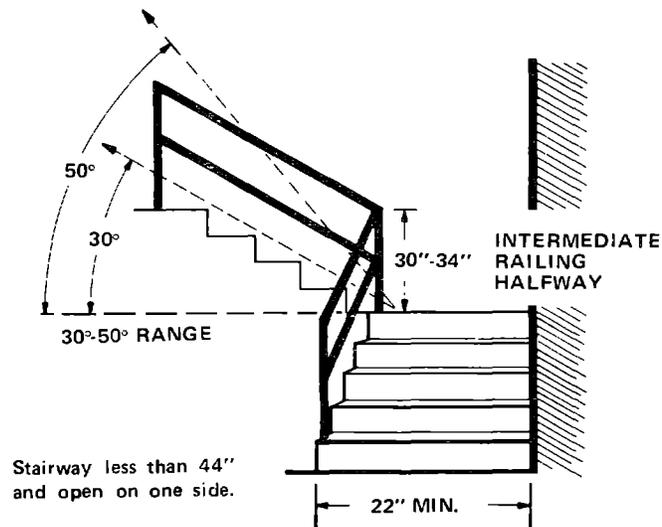
a. A stair railing is required on each open side.

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.



NIOSH

FREQUENTLY VIOLATED REGULATIONS 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.

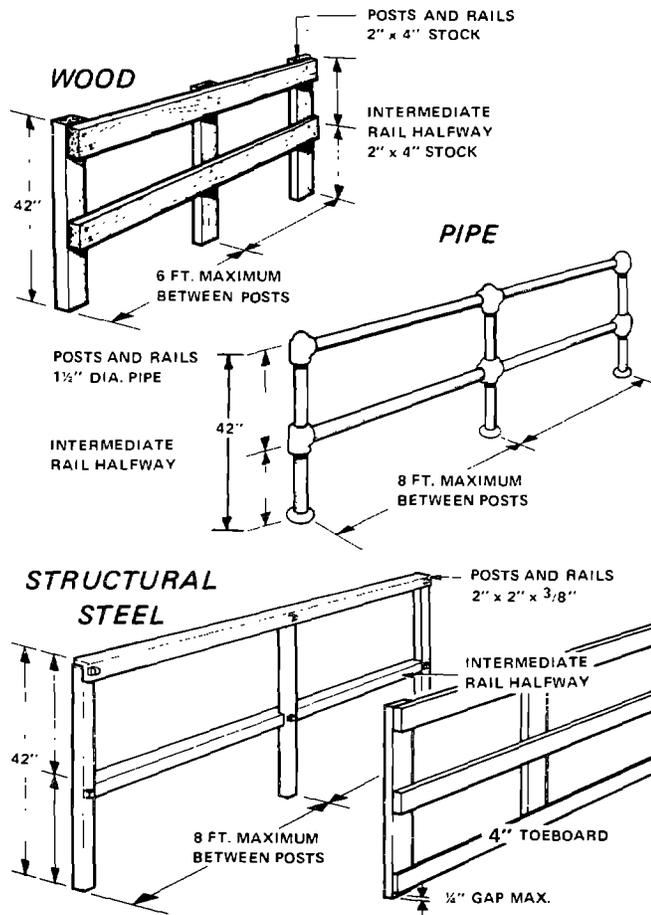
4. Every open vat or mixer whose top edge is near the floor or platform.

NIOSH

FREQUENTLY VIOLATED REGULATIONS 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

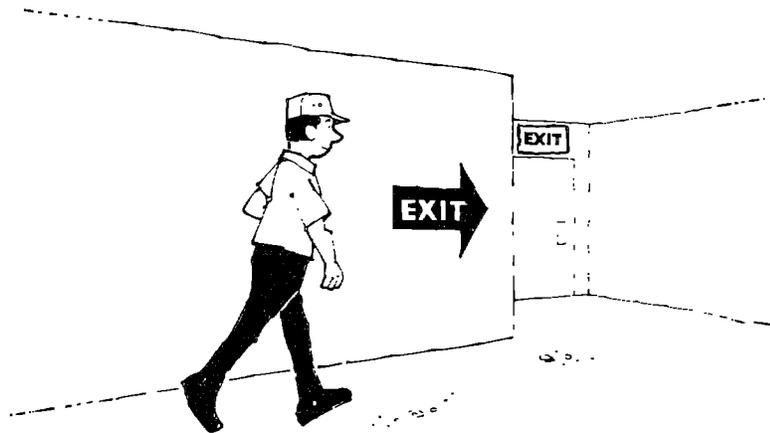


NIOSH

FREQUENTLY VIOLATED REGULATIONS 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 $\frac{3}{4}$ 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.

NIOSH

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.

NIOSH

FREQUENTLY VIOLATED REGULATIONS OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL

Employees working in the concrete products industry may be exposed to a number of potentially hazardous materials. Dusts, such as cement, sand, gravel, asbestos, etc. are problems in material batching and mixing. Potentially high levels of oil or kerosene mists may become airborne when applied to product forms as an aerosol spray.

Whenever hazardous conditions exist, worker exposure must be reduced to acceptable levels either by engineering controls or administrative methods (e.g., allowing workers to spend only four hours per shift in a particular area). Respiratory protection is acceptable only during implementation of engineering measures or if the engineering controls are not feasible.



NIOSH

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.

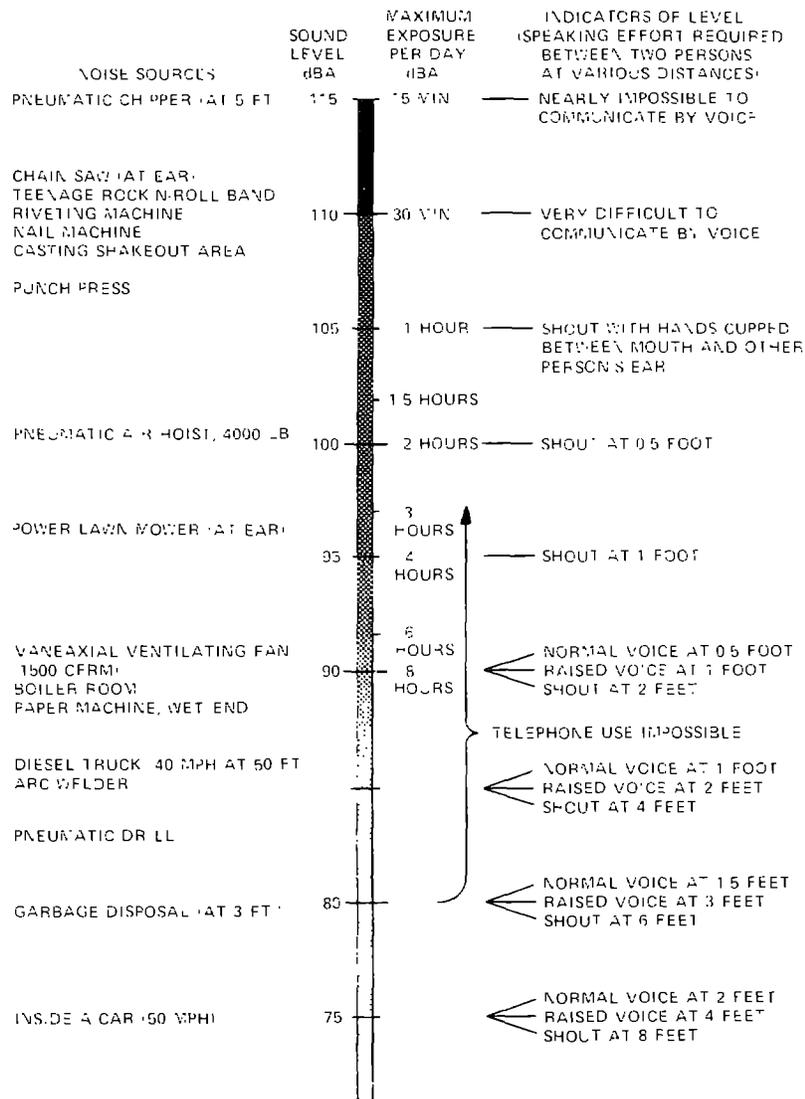
At greater than 90 dBA exposure (eight hours per day) or for higher noise levels in excess of the allowable time (e.g., 100 dBA for more than two hours) a continuing, effective hearing conservation program must be administered. Reference to the following table gives estimates of noise levels and the 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.

NIOSH

FREQUENTLY VIOLATED REGULATIONS OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL (cont.)

PERMISSIBLE NOISE EXPOSURES



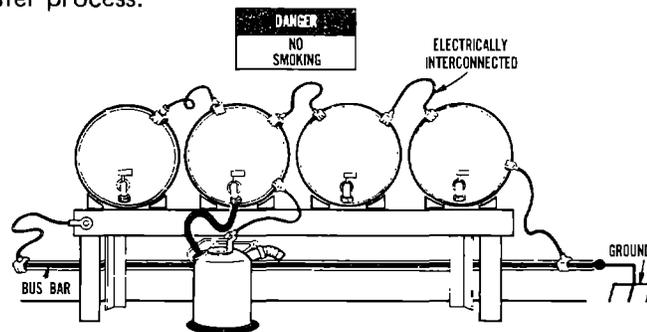
NIOSH

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 clean-up personnel with appropriate protective equipment. These liquids must not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.

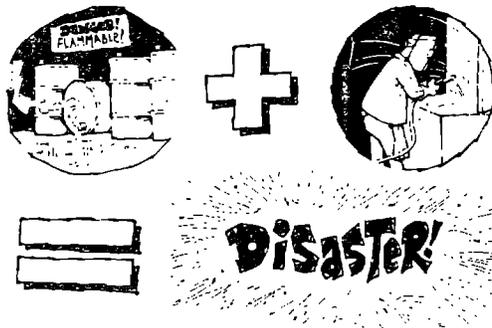
4. Supplies of flammable and combustible liquids must be stored in approved fire-resistant safety containers equipped with flash screens and self-closing lids. These containers can be purchased in an industrial supply house.

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

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

NIOSH

FREQUENTLY VIOLATED REGULATIONS HAZARDOUS MATERIALS (cont.)



STORAGE CABINETS

Cabinets must be distinctly labeled "FLAMMABLE—KEEP FIRE AWAY", and meet the National Fire Protection Associations standards. Some of the most important specifications are:

1. Metal cabinets must be constructed of at least No. 18 gauge sheet iron, double-walled with a 1½-inch air space between.
2. Doors must have three-point locks with the sill raised at least two inches above the cabinet floor.
3. Wooden cabinets must be constructed of one-inch plywood with rabbetted joints fastened two-directionally with flathead screws.

INSIDE STORAGE

Adequate venting must 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.

NIOSH

FREQUENTLY VIOLATED REGULATIONS HAZARDOUS MATERIALS (cont.)

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.

LP STORAGE AREA

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



NIOSH

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.

Personal protective equipment must 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, 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 and engineering or administrative controls are not feasible.

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. When handling rough or sharp objects (e.g., sharp metal) gloves should also be worn.

NIOSH

FREQUENTLY VIOLATED REGULATIONS PERSONAL PROTECTIVE EQUIPMENT (cont.)

APRONS

When aprons are used as protection from caustics, the apron material must be impervious to the caustics.

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 must be provided and used whenever it is necessary by reason of the hazards involved (hazard to extremities because of handling heavy loads or objects) which are capable of causing injury or impairment. Safety-toe footwear must meet the requirements of ANSI Standard Z41.1-1967.

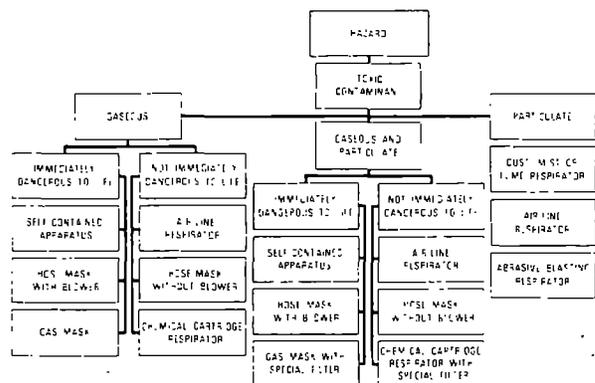
NIOSH

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.



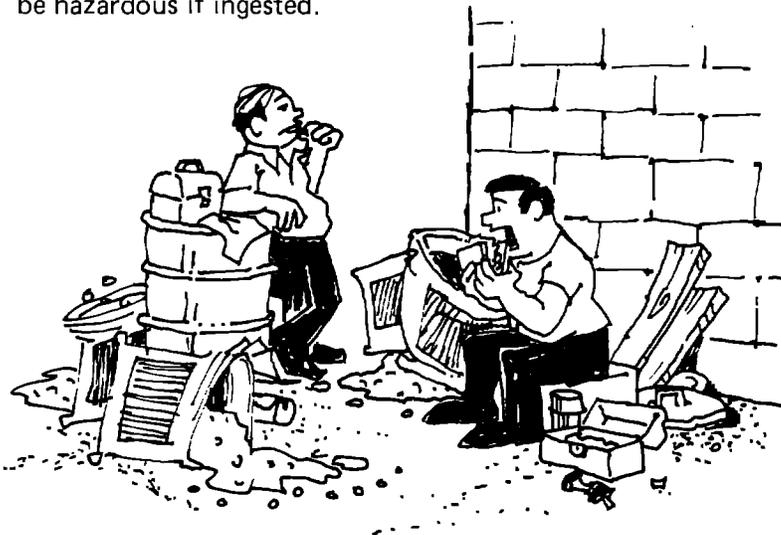
NIOSH

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.

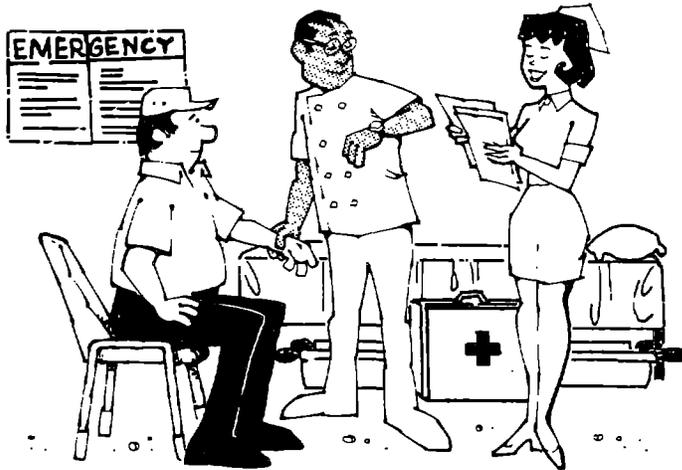
NIOSH

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.

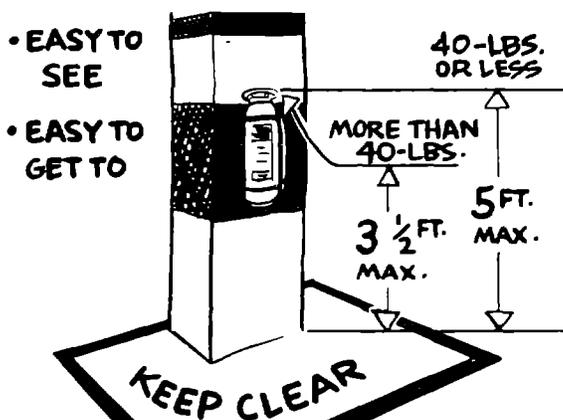
Note: First aid is immediate, temporary treatment given in the event of accident or illness—before the doctor arrives.

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.

NIOSH

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.

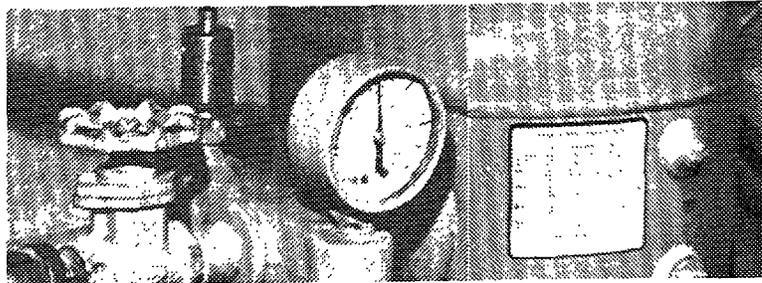
A chart showing fire extinguishers by class and how to use them, is located in the back of this booklet.

NIOSH

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.

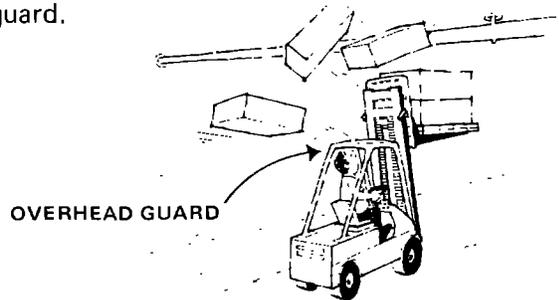
6. For the safe use and maintenance of steam pressure vessels consult your local or state code for applicable requirements.

NIOSH

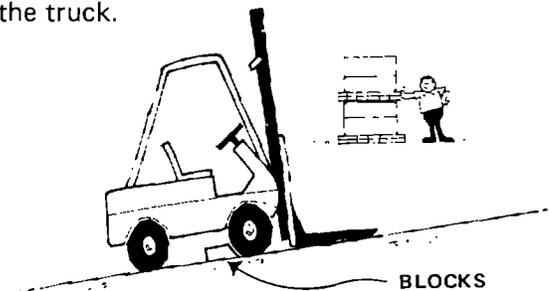
FREQUENTLY VIOLATED REGULATIONS MATERIALS HANDLING AND STORAGE POWERED INDUSTRIAL TRUCKS

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.

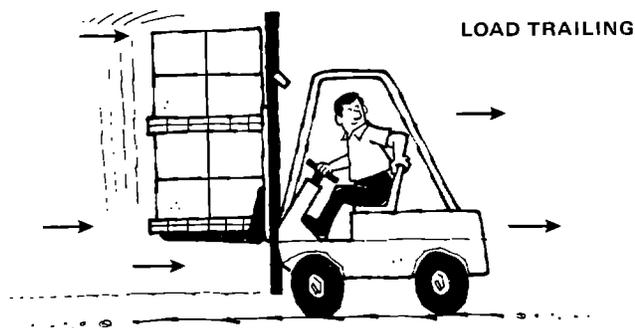


3. When a powered industrial truck is left unattended (operator more than 25 feet from the truck), the forks must be fully lowered, the control lever positioned in neutral, the power shut off, and the brakes set. The wheel must be blocked if parked on an incline.

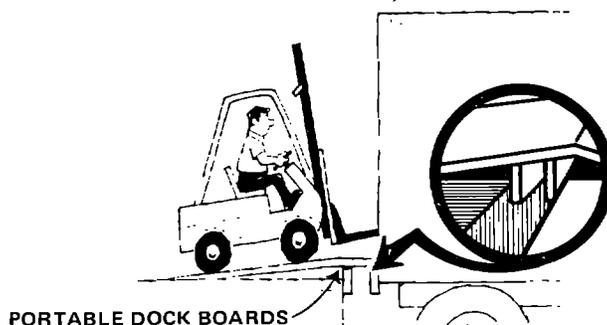
NIOSH

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.

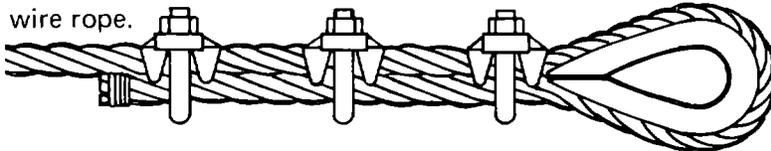
NIOSH

FREQUENTLY VIOLATED REGULATIONS MATERIALS HANDLING AND STORAGE (cont.)

RIGGING EQUIPMENT

The following are cautions for avoiding hazards in using rigging equipment.

1. Hooks must have no cracks or other deformation.
2. The rated capacity of the hooks must be equal to that of the chain.
3. It is not permitted to use job (i.e., shop) hooks or make-shift fasteners constructed from bolts, rods, etc.
4. Rope slings, including end connections, may not have excessive wear, broken wires, kinks, or twists.
5. Rigging equipment when not in use must be removed from the immediate work area.
6. All hoisting equipment, slings, webbing, and rope cable, must be inspected visually every day for unusual wear and serviceability. A monthly, itemized, inspection report must be written for all lifting equipment.
7. Protruding ends of strands in splices or slings and bridles must be coffered or blunted.
8. It is not permitted to tie or secure wire rope with knots.
9. An eye splice made in any wire rope may not have less than three full tucks.
10. When used for eye splices, the 'U' bolt must be applied so that the 'U' section is in contact with the dead end of the wire rope.



11. Manila rope must be used in accordance with manufacturer's recommendations. Knots may not be used in lieu of splices.
12. Synthetic webbing (nylon, polyester, and polypropylene) must be coded to show:
The name or trademark of the manufacturer, rated capacities for the type of hitch, and the type of material. (The rated capacity must not be exceeded.)

NIOSH

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 the 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.

OVERHEAD AND GANTRY CRANES

1. All outdoor bridge cranes must be equipped with an automatic wind velocity alarm that will warn the operator at a predetermined wind velocity. Automatic rail clamps will be activated at this predetermined wind velocity.

2. Rated load of the crane must be plainly marked on each side of the crane.

3. Minimum clearance of three feet overhead and two feet laterally must be provided between the crane and any obstructions.

4. A fixed ladder, stairs, or platforms must be provided for safety in entering or leaving the cab.

5. Exposed moving parts such as gears, set screws, chains, and sprockets must have an adequate cover guard to prevent injury during normal operation.

6. The operator must not carry the load over the heads of the ground crew or other people.

7. The operator must not leave his place at the controls when the load is suspended.

NIOSH

FREQUENTLY VIOLATED REGULATIONS MATERIALS HANDLING AND STORAGE (cont.)

8. Tools, oil cans, and waste material must be stored in their proper place and not on the floor of the cab or on the crane.

9. An adequate fire extinguisher with instructions for its use must be provided.

TRUCK CRANES

1. A load-rating chart must be posted at the operator's position.

2. Frequent inspections, on a daily, weekly, and monthly basis, must be made. Adequate inspections must be maintained on critical items of the equipment, such as, brakes, crane hooks, and ropes. Written records of monthly inspections of load-attachment equipment must be maintained.

3. When lifting, the operator must make certain that the load is properly balanced before it is lifted, and that the crane is level.

4. Never allow the load to be moved over anyone's head.

5. When moving a crane, the boom must be carried in the direction of motion.

6. It is necessary also to make certain that the crane's superstructure is secured against rotation.

7. The empty hook must be lashed or otherwise secured so that it cannot swing freely.

8. When a crane is operated near electric power lines, there must be at least 10 feet of clearance between the lines and any part of the crane.

MATERIALS HANDLING AND STORAGE

Vehicles making deliveries of building materials such as concrete products, must have a signal alarm which operates when the vehicle is moving backwards. The alarm must be audible above the surrounding noise level. Without such a device, the vehicle may be backed only if an observer signals that is safe to do so.

This requirement stems from OSHA construction standards (Title 29 Code of Federal Regulations—Part 1926).

NIOSH

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.

A booklet entitled "The Principles and Techniques of Mechanical Guarding", OSHA 2057, can be obtained by writing to OSHA Regional Offices listed in the back of this book. 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 following pages contain examples of specific conditions that must be guarded.

GENERAL REQUIREMENTS FOR MACHINE GUARDING

1. One or more methods of machine guarding must be provided to protect the operator and other employees in the machine area from hazards.

2. Guards must be attached to the machine if possible. The guard should be such that it does not constitute a hazard.

3. The guarding device must conform to appropriate standards, or if no standards exist, be designed and made to prevent the operator from having any part of his body in the danger zone during the operating cycle.

4. All belts, pulleys, chains, sprockets, and gears must be effectively guarded.

5. All belts, chain drives, shafting, couplings, keys, collars, clutches located seven feet or less above the ground, floor, or working platform, must be guarded to prevent accidental contact. V belts and chain drives must be completely enclosed.

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FREQUENTLY VIOLATED REGULATIONS MACHINERY AND MACHINE GUARDING (cont.)

6. Belt conveyors must have the nip point of head, tail, and take-up pulleys protected with guards that cover the entire side of the pulleys and extend at least three feet from the point of contact of the belt with the pulleys.

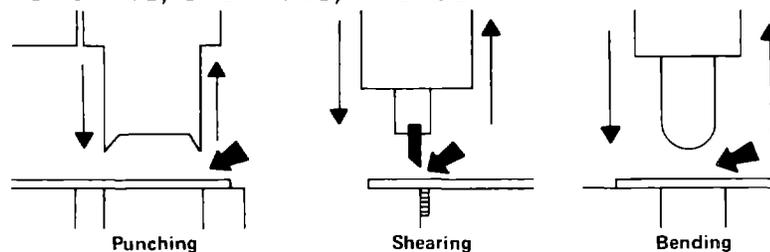
In determining guarding methods, the type of operation, the size or shape of stock, the method of handling, the physical layout, the type of material, and the production requirements or limitations may present important considerations. A certain flexibility in operations may also determine the practicability of the methods to be used.

As a general rule, power transmission apparatus can be protected by fixed enclosure guards. It is when guarding the point-of-operation, where work is being done on an object, that the most effective and practical of several means of guarding must be selected.

PUNCHING, SHEARING, AND BENDING ACTIONS

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

PUNCHING, SHEARING, AND BENDING



Typical examples of equipment involving punching, shearing, or bending action include power presses, foot and hand presses, bending presses or brakes, as well as squaring, guillotine, and alligator shears.

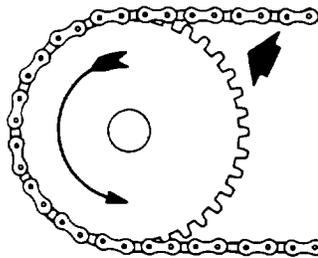
NIOSH

FREQUENTLY VIOLATED REGULATIONS MACHINERY AND MACHINE GUARDING (cont.)

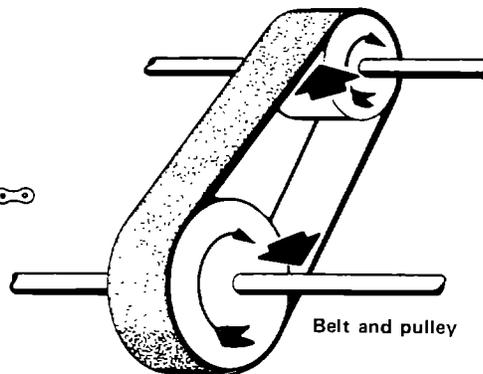
IN-RUNNING NIP POINTS

In-running nip points are a special danger existing only through action of rotating objects. Whenever machine parts rotate toward each other, or where one rotates toward a stationary object, an in-running nip point is formed. Objects or parts of the body may be drawn into this nip point and be bruised and crushed.

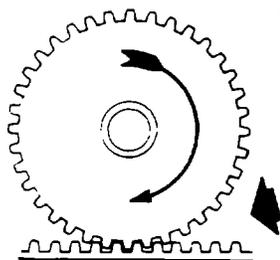
The in-running side of rolling mills and calenders, of rolls used for bending, printing, corrugating, embossing or feeding and conveying stock, the in-running side of a chain and sprocket, belt and pulley, a gear rack, a gear and pinion, and a belt conveyor terminal are typical examples of nip point hazards.



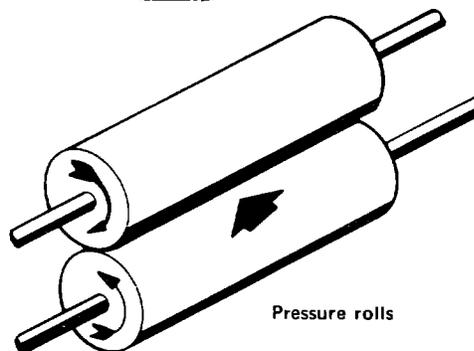
Chain and sprocket



Belt and pulley



Rack and gear



Pressure rolls

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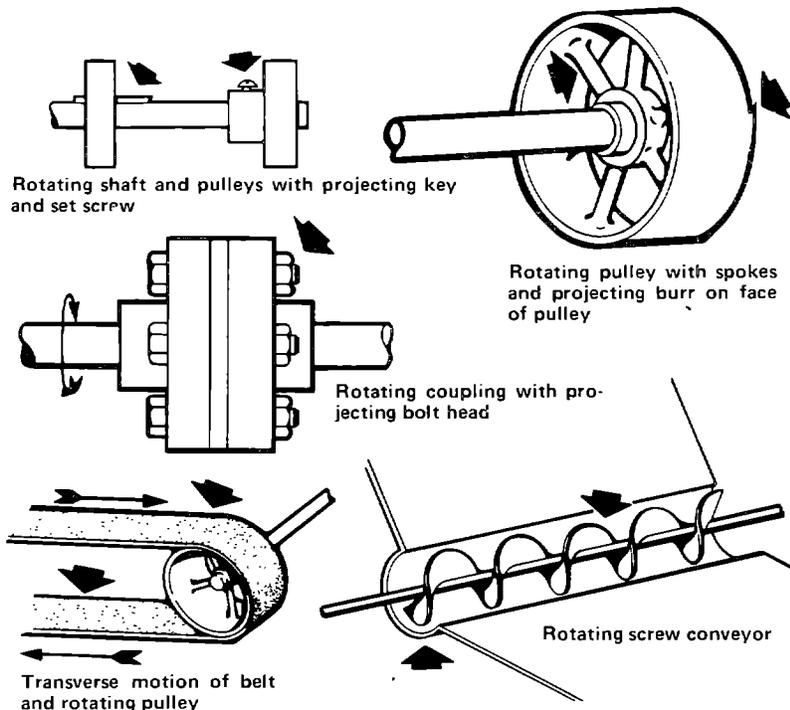
FREQUENTLY VIOLATED REGULATIONS MACHINERY AND MACHINE GUARDING (cont.)

ROTATING, RECIPROCATING, AND TRANSVERSE MOTION

Rotating, reciprocating, and transverse motions create hazards in two general areas—at the point-of-operation where power or motion is being transmitted from one part of a mechanical linkage to another. Even smooth, slowly rotating shafts can grip clothing or hair, and through mere skin contact force an arm or hand into a dangerous position.

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

EXAMPLES OF TYPICAL ROTATING, RECIPROCATING, AND TRANSVERSE MECHANISMS



NIOSH

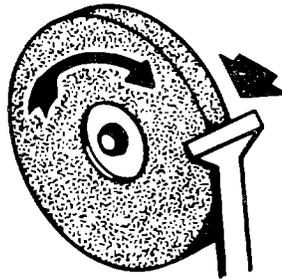
FREQUENTLY VIOLATED REGULATIONS MACHINERY AND MACHINE GUARDING (cont.)

CUTTING ACTIONS

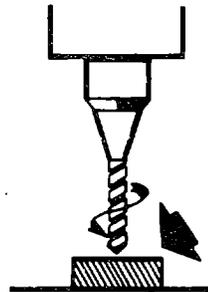
Cutting action results when rotating, reciprocating, or transverse motion is imparted to a tool so that material being removed is in the form of chips. The danger of cutting action exists at the movable cutting edge of the machine as it approaches or comes in contact with the material being cut. Such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

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

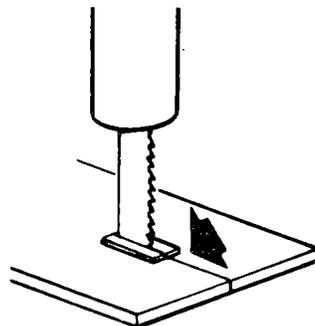
EXAMPLES OF CUTTING ACTIONS



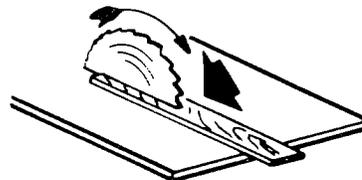
Abrasive wheel



Drill



Band saw



Circular saw

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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.

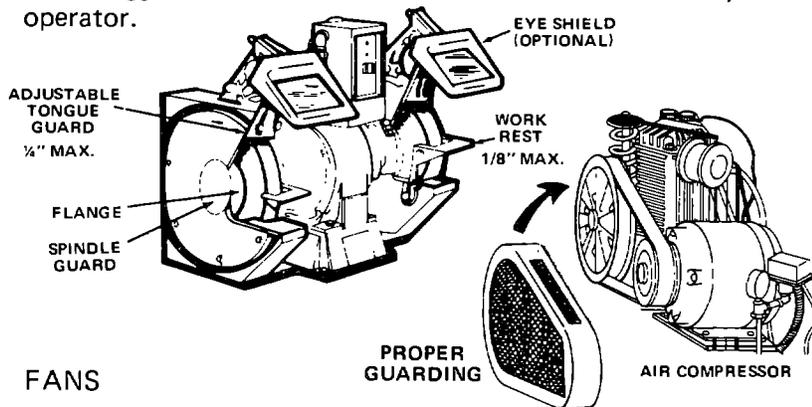
The exposed area of the grinding wheel and sides for the safety guards should not exceed more than one-fourth of the entire wheel.

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 $\frac{1}{8}$ 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 $\frac{1}{4}$ 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 $\frac{1}{2}$ inch.

AIR COMPRESSORS

Must have their flywheel and drive pulley fully enclosed.

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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.

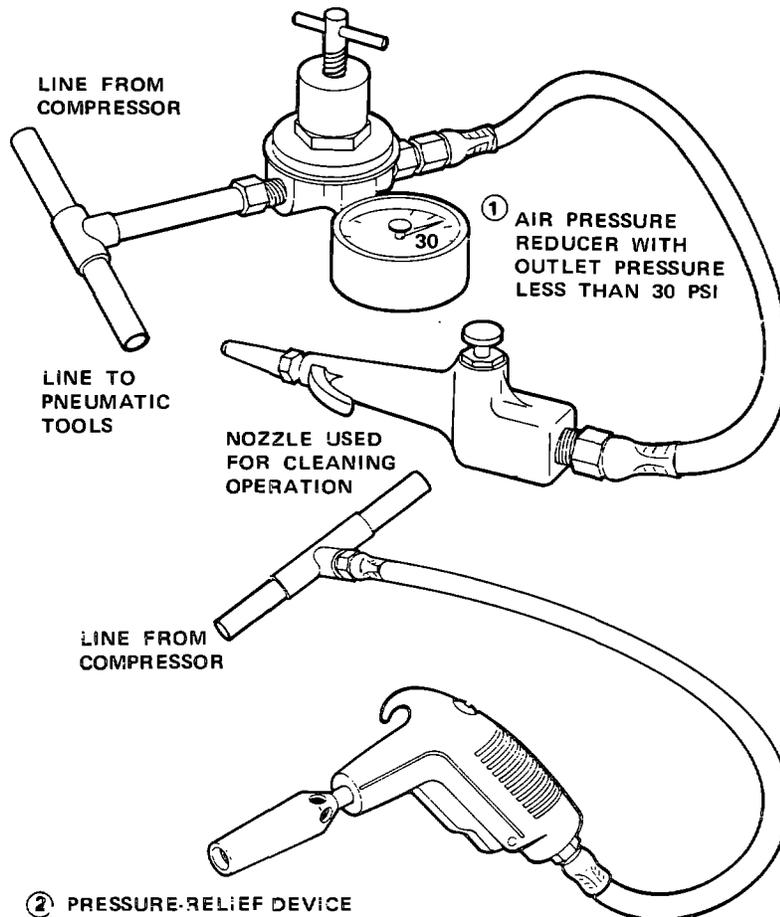
5. All hand-held portable electrical equipment must have its frame grounded by means of a separate ground wire or be doubly insulated and identified as such.



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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.



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FREQUENTLY VIOLATED REGULATIONS

WELDING, CUTTING, AND BRAZING

COMPRESSED GAS



It is required that:

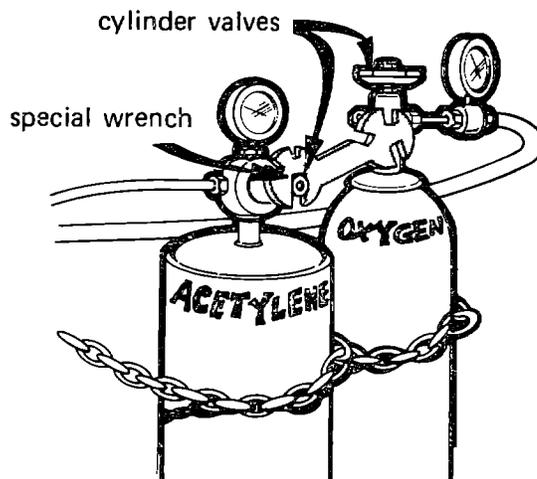
1. All cylinders be kept away from radiators and other sources of heat.
2. All cylinders stored inside buildings are located in a well-protected, well-ventilated, dry location at least 20 feet from highly combustible materials and away from elevators, stairs, or gangways. They are not to be kept in unventilated enclosures such as lockers and cupboards.
3. Valve protection caps are utilized where the cylinder is designed to accept a cap except when cylinders are in use or connected for use.



4. Stored oxygen cylinders are separated from stored fuel gas cylinders or combustible materials (especially oil or grease) by a minimum distance of 20 feet or by a noncombustible barrier at least five feet high and having a one-half hour fire resistance rating.

NIOSH

FREQUENTLY VIOLATED REGULATIONS WELDING, CUTTING, AND BRAZING (cont.)



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

6. All cylinders are legibly marked to identify contents.

7. Cylinders should be stored in assigned locations where they will not be knocked over or damaged. It is good practice to secure them with lashing or chains.

8. Acetylene must not be utilized at a pressure in excess of 15 psi gauge (or 30 psi absolute).

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

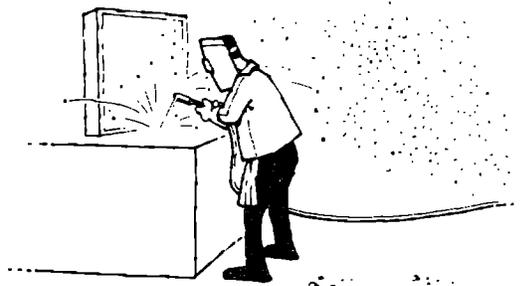
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FREQUENTLY VIOLATED REGULATIONS WELDING, CUTTING, AND BRAZING (cont.)



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

11. Management must establish areas for cutting and welding based on the fire potentials of the plant, and establish procedures for welding and cutting in other areas.



12. All welders are trained in the safe operation and use of this equipment.

13. Cutting or welding is not permitted in the presence of explosive atmospheres which may develop inside uncleaned or improperly prepared tanks or equipment, or where combustible dusts are present.

14. Periodic inspection of all resistance welding equipment must be made by qualified maintenance personnel, and records maintained.

15. The work area is made safe by removing combustibles or by protecting them from possible ignition.

16. Fire extinguishing equipment is readily available.

17. Hazardous fumes may be produced during these operations; adequate ventilation must always be provided.

18. Personal protective equipment must be worn when employees are performing these tasks.

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FREQUENTLY VIOLATED REGULATIONS THE NATIONAL ELECTRICAL CODE (NEC)

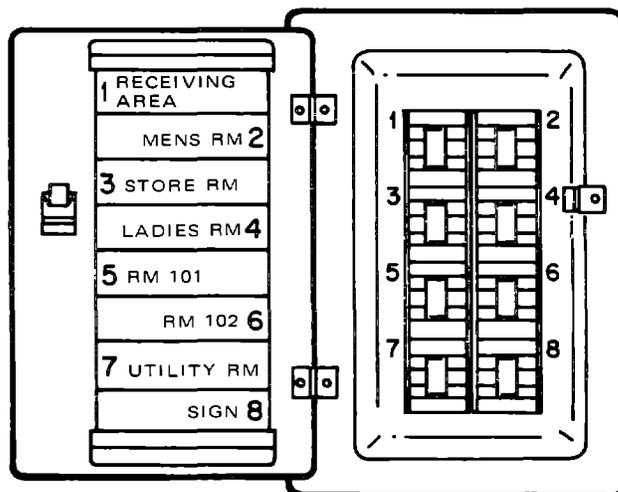
ELECTRICAL REQUIREMENTS

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.

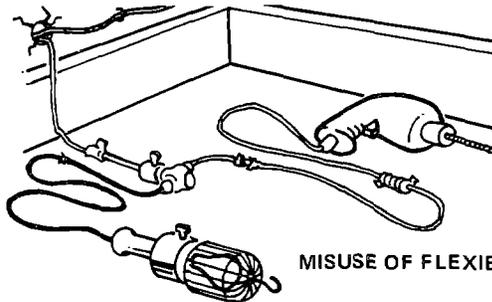
3. Exposed noncurrent-carrying metal parts of fixed equipment that may become energized under abnormal conditions must be grounded under any of the following circumstances:

- 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.



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.

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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 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 and inspectors are responsible for enforcing 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 the employer and employee who assemble, the OSHA Compliance Officer must consult with a representative 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 and an OSHA inspector may be available to investigate conditions in the workplace. OSHA will attempt to resolve complaints named by employees concerning:

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

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

Citation: Upon inspection OSHA believes an employee who is absent from the Act is a violation. Such violations will be cited to the employer. Each citation will specify a time period within which the alleged violation must be corrected.

The OSHA citation must be prepared and filed by the inspector at the place of violation for three days or until it is corrected, whichever is later. In cases involving employees of dangerous jobs, the citation must be prepared and filed immediately.

Proposed Penalty: The Act provides for monetary penalties against employers of up to \$100 for each serious violation and up to \$500 for each general violation. Penalties of up to \$100 per day may be imposed for failure to correct violations within the prescribed time period. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to \$5,000 for each such violation.

Criminal penalties are also provided for in the Act. Any individual who, resulting in death of an employee, upon conviction is punishable by a fine of not more than \$10,000 or by imprisonment for no 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 violation to reduce hazards 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 each Area Office should be filed in the local directories under the United States Department of Labor in the United States Government listing.



Washington, D.C.
20201
OSHA 2203

Peter J. Brennan
Peter J. Brennan
Secretary of Labor

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

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

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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."



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CHECKLISTS (cont.)

WALKING AND WORKING SURFACES

AISLES AND FLOOR (29 CFR 1910.22)

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

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

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

STAIRS (29 CFR 1910.24)

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

NIOSH

CHECKLISTS (cont.)

	Yes	No
Do stairs have at least a seven-foot overhead clearance? _____	<input type="checkbox"/>	<input type="checkbox"/>
Do stairs angle no more than 50° and no less than 30°? _____	<input type="checkbox"/>	<input type="checkbox"/>
LADDERS (29 CFR 1910.25, .26, .27)		
Have defective ladders (e.g., broken rungs, side rails, etc.) been tagged as "DANGEROUS, DO NOT USE" and removed from service for repair or destruction? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is it prohibited to use the top of an ordinary step ladder as a step? _____	<input type="checkbox"/>	<input type="checkbox"/>
Do fixed ladders have at least 3½ feet of extension at the top of the landing? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is the distance between the centerline of rungs on a fixed ladder and the nearest permanent object in back of the ladder at least seven inches or more? _____	<input type="checkbox"/>	<input type="checkbox"/>
Do all fixed ladders have a preferred pitch of 75°-90°? _____	<input type="checkbox"/>	<input type="checkbox"/>
EGRESS (29 CFR 1910.36-.37)		
Are all exits marked with an exit sign and illuminated by a reliable light source? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is the lettering at least six inches high with the principle letter strokes at least ¾ of an inch wide? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is the direction to exits, when not immediately apparent, marked with visible signs? _____	<input type="checkbox"/>	<input type="checkbox"/>

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CHECKLISTS (cont.)

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.?

Yes No

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?

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CHECKLISTS (cont.)

	Yes	No
If asbestos is used as an extender or filler: Have employee exposures been determined? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are exposed employees given annual physical examinations? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are employees required to wear personal protective equipment when handling solvents, resins, pigments, etc. to avoid eye or skin contact? _____	<input type="checkbox"/>	<input type="checkbox"/>
OCCUPATIONAL NOISE EXPOSURE (29 CFR 1910.95)		
If a noise problem is suspected, have noise levels been accurately measured? _____	<input type="checkbox"/>	<input type="checkbox"/>
If a noise problem exists, have plans to reduce noise levels by engineering methods been formulated (e.g., enclosure, maintenance, dif- ferent methods of processing)? _____	<input type="checkbox"/>	<input type="checkbox"/>
If engineering controls cannot reduce the noise to safe levels:		
1. Have administrative controls, such as limiting worker-exposure in a given area, been started? _____	<input type="checkbox"/>	<input type="checkbox"/>
2. Are affected employees given annual audiometric tests, if necessary? _____	<input type="checkbox"/>	<input type="checkbox"/>
3. Do all employees in high-noise areas wear hearing protection? _____	<input type="checkbox"/>	<input type="checkbox"/>
4. Are annual noise surveys made to re- evaluate the problem? _____	<input type="checkbox"/>	<input type="checkbox"/>

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CHECKLISTS (cont.)

HAZARDOUS MATERIALS

FLAMMABLE AND COMBUSTIBLE LIQUIDS (29 CFR 1910.106)

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

Yes No

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"?

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CHECKLISTS (cont.)

	Yes	No
Are storage areas for flammables prominently posted as a "NO SMOKING" area? _____	<input type="checkbox"/>	<input type="checkbox"/>

Is there never more than one day's supply of flammable liquids outside of approved storage cabinets or rooms? _____	<input type="checkbox"/>	<input type="checkbox"/>
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UNDERGROUND STORAGE TANKS

Does the vent pipe extend at least 12 feet above grade? _____	<input type="checkbox"/>	<input type="checkbox"/>
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Is the vent pipe located so vapors do not discharge inside buildings or become trapped under eaves, etc.? _____	<input type="checkbox"/>	<input type="checkbox"/>
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PERSONAL PROTECTIVE EQUIPMENT (29 CFR 1910.132-.137)

Is personal protective equipment provided, used, and maintained wherever it is necessary? _____	<input type="checkbox"/>	<input type="checkbox"/>
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Is employee-owned personal protective equipment, such as gloves, protective shoes, etc., adequate and properly maintained? _____	<input type="checkbox"/>	<input type="checkbox"/>
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NIOSH

CHECKLISTS (cont.)

	Yes	No
Is eye protection available where debris or flying objects could be a hazard? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are ear plugs or muffs provided and worn during noisy conditions? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is slip-resistant footwear worn? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are hard hats or safety shoes available where falling objects could be a hazard? _____	<input type="checkbox"/>	<input type="checkbox"/>
RESPIRATORY PROTECTION DEVICES (29 CFR 1910.134)		
Are respirators provided when and where necessary? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are there written standard operating procedures for the selection and use of respirators? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is the user instructed and trained in the proper use of respirators? _____	<input type="checkbox"/>	<input type="checkbox"/>
Where practicable, are respirators assigned for use by employees individually? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are respirators cleaned and disinfected after use? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are respirators stored in a convenient, clean, and sanitary location? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are routinely-used respirators inspected during cleaning? _____	<input type="checkbox"/>	<input type="checkbox"/>

NIOSH

CHECKLISTS (cont.)

	Yes	No
GENERAL ENVIRONMENTAL CONTROLS		
SANITATION (29 CFR 1910.141-.149)		
Are restrooms and washrooms kept in clean and sanitary condition? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are covered receptacles for waste food kept in clean and sanitary condition? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are covered receptacles for sanitary napkins provided in the women's restroom? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is all water that is provided for drinking, washing, and cooking, suitable for drinking? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all outlets for water that is not suitable for drinking, clearly posted as "UNSAFE FOR DRINKING, WASHING, OR COOKING"? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are employees prohibited from eating in areas where toxic materials are present? _____	<input type="checkbox"/>	<input type="checkbox"/>
Has pest control been exercised? _____	<input type="checkbox"/>	<input type="checkbox"/>
If employees are permitted to eat on the premises, are they provided with a suitable space for that purpose? _____	<input type="checkbox"/>	<input type="checkbox"/>
MEDICAL AND FIRST AID (29 CFR 1910.151)		
Are first aid supplies readily available, inspected, and replenished? _____	<input type="checkbox"/>	<input type="checkbox"/>

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.)	<input type="checkbox"/>	<input type="checkbox"/>
Are first aid supplies approved by a consulting physician, indicating that they are adequate?	<input type="checkbox"/>	<input type="checkbox"/>
Are medical personnel readily available for advice and consultation on matters of employee health?	<input type="checkbox"/>	<input type="checkbox"/>
Is there a first aid kit easily accessible to the work area?	<input type="checkbox"/>	<input type="checkbox"/>
Are emergency phone numbers posted?	<input type="checkbox"/>	<input type="checkbox"/>
Where employees may be exposed to injurious corrosive materials, are they provided with quick-drenching and flushing facilities for immediate emergency use?	<input type="checkbox"/>	<input type="checkbox"/>
FIRE PROTECTION (29 CFR 1910.157, .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	<input type="checkbox"/>	<input type="checkbox"/>
Are extinguishers fully charged and in designated places?	<input type="checkbox"/>	<input type="checkbox"/>

NIOSH

CHECKLISTS (cont.)

	Yes	No
Are extinguishers located along normal paths of travel? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are extinguisher locations free from obstruction or blockage? _____	<input type="checkbox"/>	<input type="checkbox"/>
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. _____	<input type="checkbox"/>	<input type="checkbox"/>
Have all extinguishers been serviced, maintained, and tagged at intervals not to exceed one year? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all extinguishers checked (by management or designated employee) monthly to see if they are in place or if they have been discharged, etc.? _____	<input type="checkbox"/>	<input type="checkbox"/>
AUTOMATIC SPRINKLER (if applicable)		
Is there at least one automatic water supply of adequate pressure, capacity, and reliability? _____	<input type="checkbox"/>	<input type="checkbox"/>
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. _____	<input type="checkbox"/>	<input type="checkbox"/>
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? _____	<input type="checkbox"/>	<input type="checkbox"/>

NIOSH

CHECKLISTS (cont.)

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

NIOSH

CHECKLISTS (cont.)

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

Is there safe clearance for equipment through aisles and doors?

Yes No

Is stored material stable and secure?

Are storage areas free from tripping hazards?

Are only trained operators allowed to operate powered lift trucks?

Are appropriate overhead guards installed on powered lift trucks?

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

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

Are 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? _____	<input type="checkbox"/>	<input type="checkbox"/>
If motorized equipment, such as lift trucks, is used, are aisles permanently marked, providing sufficient clearance for passage of the equipment? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are specifications posted for maximum loads which are approved for floors (except slabs with no basements), roof of a building, or some other structure? _____	<input type="checkbox"/>	<input type="checkbox"/>
MACHINE AND MACHINE GUARDING (29 CFR 1910.212)		
Are belts, pulleys, and rotating shafts (air compressor, drill presses, etc.) properly guarded? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are chains, sprockets, and gears properly guarded? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all in-going nip points properly guarded? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are rotating shafts that are not smooth properly guarded? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all rotating parts (lubrication, fittings, etc.) recessed or covered with collars? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all pieces of equipment with an electric motor or any electrical connection effectively grounded? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are sprockets and V-belt drives within reach of platforms and passageways or less than seven feet from the floor completely enclosed? _____	<input type="checkbox"/>	<input type="checkbox"/>

NIOSH

CHECKLISTS (cont.)

Are fans less than seven feet above floor guarded, having openings $\frac{1}{2}$ inch or less?

ABRASIVE WHEEL MACHINERY (Grinders) (29 CFR 1910.215)

Is the work rest used and kept adjusted to within $\frac{1}{8}$ inch of wheel?

Is the adjustable tongue on top side of grinder used and kept adjusted to within $\frac{1}{4}$ 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? _____

PORTABLE TOOLS AND EQUIPMENT (29 CFR 1910.244)

JACKS

Are jacks checked periodically to see if they are still in good condition?

Are loads on jacks, cribbed, blocked, or secured at once?

NIOSH

CHECKLISTS (cont.)

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

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

Have mushroomed heads on chisels, punches, etc. been reconditioned or replaced if necessary? _____

Have broken hammer handles been replaced?

Have worn or bent wrenches been replaced?

Have 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?

WELDING, CUTTING, AND BRAZING (29 CFR 1910.252)

Are fuel gas cylinders and oxygen cylinders separated by 20 feet or a barrier five feet high having a ½-hour fire resistance rating?

NIOSH

CHECKLISTS (cont.)

	Yes	No
Are cylinders secured and stored where they cannot be knocked over? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are cylinder protective caps in place except when the cylinder is in use? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are compressed gas cylinders kept away from sources of heat, elevators, stairs, or gangways? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are only instructed employees, who are judged competent by the employer, allowed to use oxygen or fuel gas equipment? _____	<input type="checkbox"/>	<input type="checkbox"/>
Do all cylinders (except those with fixed hand wheels) have non-adjustable wrenches, keys, or handles in place on valve stems while cylinders are in use? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is welding always conducted at a safe distance from flammable liquids? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are all compressed gas cylinders legibly marked for identifying the content? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are the valves shut off when the cylinder is not in use? _____	<input type="checkbox"/>	<input type="checkbox"/>



CHECKLISTS (cont.)

	Yes	No
Are flash shields provided to protect nearby workers from the welding flash? _____	<input type="checkbox"/>	<input type="checkbox"/>
NATIONAL ELECTRICAL CODE		
ELECTRICAL WIRING		
Have exposed wires, frayed cords, and deteriorated insulation been repaired or replaced? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are junction boxes, outlets, switches, and fittings covered? _____	<input type="checkbox"/>	<input type="checkbox"/>
Is all metal fixed electrical equipment grounded? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are flexible cords and cables fastened so that there is no direct pull on joints or terminal screws? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are flexible cords and cables never substituted for fixed wiring? _____	<input type="checkbox"/>	<input type="checkbox"/>
Do flexible cords and cables not run through holes in wall or ceiling or through doorways or windows? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are flexible cords and cables free from splices or taps? _____	<input type="checkbox"/>	<input type="checkbox"/>
Does all equipment connected by cord and plug have grounded connections? _____	<input type="checkbox"/>	<input type="checkbox"/>
Are electrical appliances such as vacuums, polishers, vending machines, etc. grounded? _____	<input type="checkbox"/>	<input type="checkbox"/>

NIOSH

CHECKLISTS (cont.)

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 calendar year and been recorded on OSHA Form No. 102? Was it posted during the month of February?

Have all OSHA records been retained for a period of 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?



INFORMATION SOURCES

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

- A12.1 Floor and Wall Openings
- A14.1 Portable Wood Ladders
- A58.1 Minimum Design Load
- A64.1 Fixed Stairs
- B15.1 Mechanical Power Transmission
- C1 National Electric Code
- Z4.1 Sanitation in Places of Employment

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-13A-1971
- NFPA-17-1969 Dry Chemical Extinguishing Systems
- NFPA-70-1971 National Electric Code

NATIONAL SAFETY COUNCIL 425 North Michigan Avenue Chicago, Illinois 60611

Prestressed Concrete Institute
20 North Wacker Drive
Chicago, Illinois 60606
Safety and Loss Prevention Manual

NIOSH AND OSHA REGIONAL DIRECTORS

Trade associations and insurance companies can also provide useful information. The Small Business Administration will provide information concerning procedures for securing economic assistance 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.: 617/223-5807

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 13761
Philadelphia, Pennsylvania 19101
Tel.: 215/597-6716

DHEW, Region IV
50 Seventh Street, N.E.
Atlanta, Georgia 30323
Tel.: 404/626-5474

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

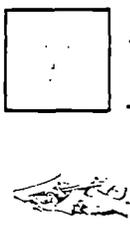
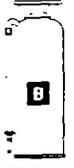
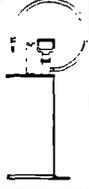
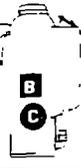
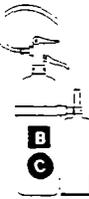
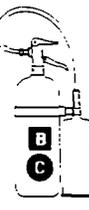
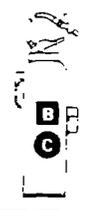
DHEW, Region VI
1114 Commerce Street (Rm. 8-C-53)
Dallas, Texas 75202
Tel.: 241/792-2261

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 (254 FOB)
San Francisco, California 94012
Tel.: 415/666-3781

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

KIND OF FIRE		APPROVED TYPE OF EXTINGUISHER						HOW TO OPERATE	
DECIDE THE CLASS OF FIRE YOU ARE FIGHTING...	... THEN CHECK THE COLUMNS TO THE RIGHT OF THAT CLASS	MATCH UP PROPER EXTINGUISHER WITH CLASS OF FIRE SHOWN AT LEFT						<p>FOAM: Don't Pour Stream into the Burning Liquid. Allow Foam to Fall Lightly on Fire.</p> 	
		FOAM Solution of Aluminum Sulphate and Bicarbonate of Soda	CARBON DIOXIDE Carbon Dioxide Gas Under Pressure	SODA ACID Bicarbonate of Soda Solution and Sulphuric Acid	PUMP TANK Plain Water	GAS CART. RIDGE Water Extinguisher, Carbon Dioxide Gas	MULTI-PURPOSE DRY CHEMICAL		ORDINARY DRY CHEMICAL
 <p>CLASS A FIRES USE THESE EXTINGUISHERS</p> <p>ORDINARY COMBUSTIBLES</p> <ul style="list-style-type: none"> WOOD PAPER CLOTH ETC. 									<p>CARBON DIOXIDE: Direct Discharge as Close to Fire as Possible. First at Edge of Flame and Gradually Forward and Upward.</p> 
 <p>CLASS B FIRES USE THESE EXTINGUISHERS</p> <p>FLAMMABLE LIQUIDS, GREASE</p> <ul style="list-style-type: none"> GASOLINE PAINTS OILS, ETC. 									<p>SODA-ACID GAS CART. RIDGE: Direct Stream at Base of Flame.</p> 
 <p>CLASS C FIRES USE THESE EXTINGUISHERS</p> <p>ELECTRICAL EQUIPMENT</p> <ul style="list-style-type: none"> MOTORS SWITCHES ETC. 									<p>DRY CHEMICAL: Direct at the Base of the Flames. In the Case of Class A Fire: Follow Up by Directing the Dry Chemical at Remaining Burning.</p> 

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

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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: 212/972-5941/2

Region III

U.S. Department of Labor
Occupational Safety and Health
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
300 South Wacker Drive, Room 1201
Chicago, Illinois 60606 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: 214/794-2477/8/9 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

HOW TO IFT SAFELY

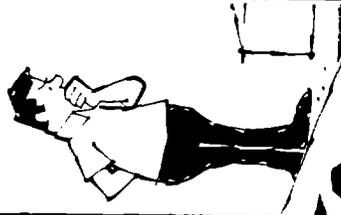
The following safe practices should be observed in order to avoid injury.

The factors that contribute to safe lifting are:



DETERMINING AN OBJECT CAN BE LIFTED AND CARRIED SAFELY

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



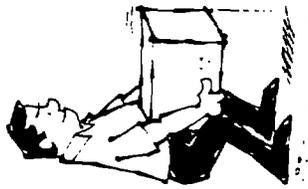
2 Place the feet 8 to 12 inches apart for good balance.



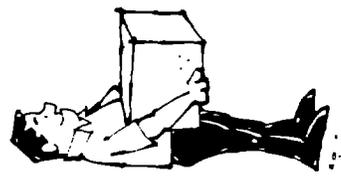
3 Bend the knees to the degree that is comfortable and get a good handhold. Then using both leg and back muscles.



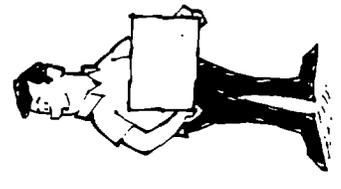
4 Lift the load straight up smoothly and evenly by pushing with your feet, keep load close to your body.



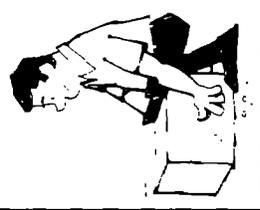
5 Lift the object into carrying position, making no turning or twisting movements until the lift is completed.



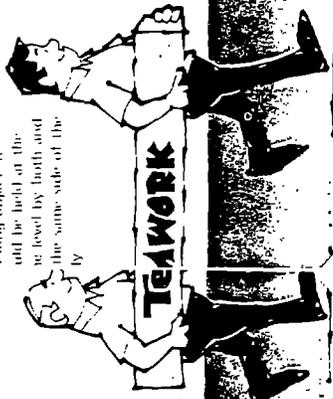
6 Turn your body with changes of foot position after looking over your path of travel making sure it is clear.



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

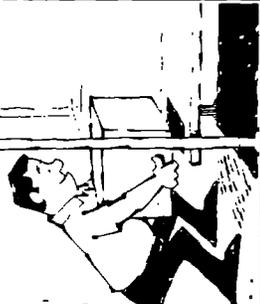


When and carrying with another person is important. Movements be coordinated so you both finish the lift at the same time (perform turning movements together).



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

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.

