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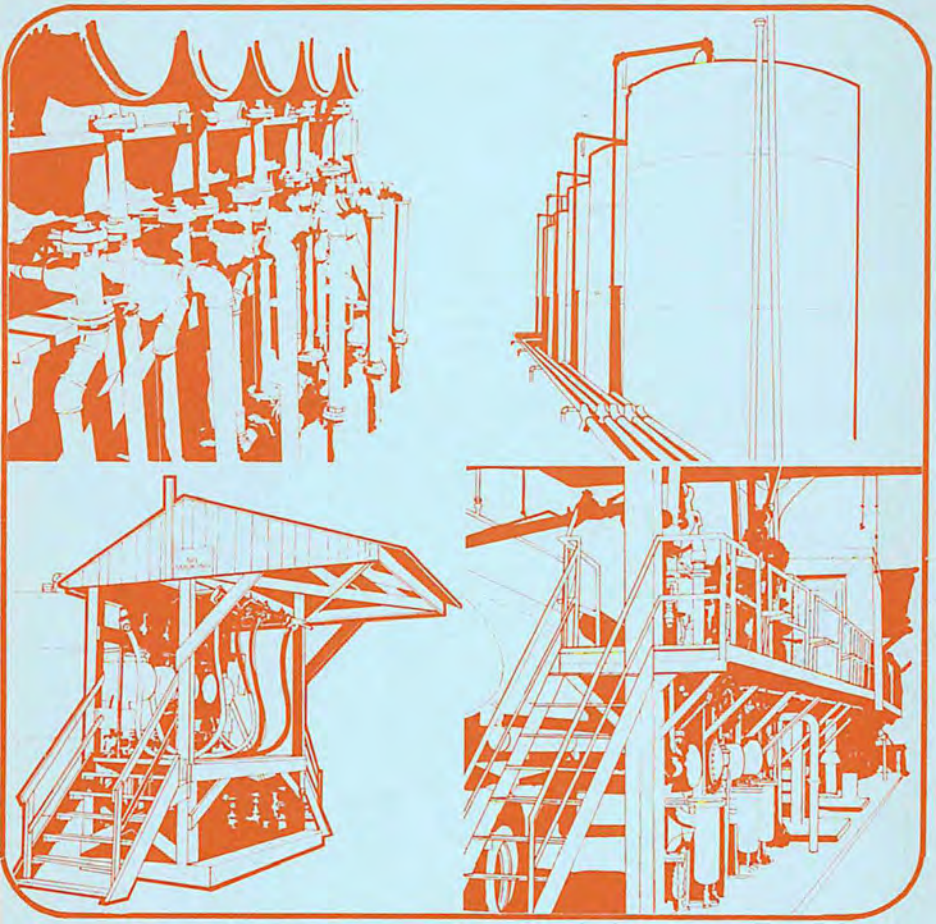
HEALTH AND SAFETY GUIDE FOR BULK PETROLEUM PLANTS



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

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HEALTH AND SAFETY GUIDES

- ☐ Bulk Petroleum Plants, Pub. No. 76-118
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Public Health Service
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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 bulk petroleum plants. The first edition of this Guide was 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", "SHALL", "REQUIRED", and "NECESSARY" 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

The purpose of a job safety and health program is to protect the employee by the prevention and control of accidents and health hazards which are involved in the elements of production and the operation of any establishment.

The elements are manpower, machinery and tools, material, equipment, and time.

The major share of all accidents, injuries, and environmental hazards are caused by unsafe conditions or unsafe acts, or both.

An unsafe condition is created by improper control of the physical, mechanical, and environmental hazards.

An unsafe act is a violation of correct work practices or methods.

Control of conditions and acts will prevent accidents, injuries, and hazardous environmental conditions.

HEALTH AND SAFETY GUIDELINES (cont.)

The control of conditions and acts depends on a Safety Program.

A successful safety program depends on:

- Leadership by the employer.
- Safe and healthful working conditions.
- Safe work practices by employees.

Top management leadership is NECESSARY for the complete acceptance of the safety program.

The department head, foreman, or supervisor who deals most directly with the employees, MUST bear the responsibility for implementing the safety and health program. With this responsibility, he MUST have appropriate authority, assistance, and support. A safety organization should be set up to carry out the firm's commitment to a Safety and Health Program.

The Safety and Health Program should include:

Conducting regular meetings to discuss preventive measures, hazards, injury and illness records or occurences, safety promotion, and motivation.

- Inspections for hazards.
- Encouraging suggestions.
- Providing the latest information on safe working methods, protective equipment, and clothing.
- Promoting safety and first aid training.
- Investigating accidents, injuries, and illnesses.
- Motivating worker's interest.

NIOSH

THE BULK PLANT

Safety in bulk storage plants depends on two major factors:

1. The design of the facility.
2. How it is operated.

No matter how well designed and safety-engineered a facility may be, it is never foolproof. In like manner, the best trained people cannot operate safely in a poorly engineered facility. Consequently, the two factors are inter-dependent for safe operation.

Failure to recognize hazardous conditions or neglecting to eliminate them can result in loss of life or serious injuries to plant personnel and costly damage to facilities. Furthermore, since the advent of the *"Occupational Safety and Health Act of 1970"*–the plant operator who chooses to ignore hazardous conditions in the workplace is risking a possibly costly confrontation with OSHA.

This booklet is designed to point out hazards that are common to the typical bulk storage plant and to suggest means to eliminate such hazards.

The **CHECKLIST** in the back of this booklet should be helpful when making a hazard review of your plant.

FLAMMABLE LIQUIDS–HANDLING AND STORAGE

Safety in handling and storing flammable liquids depends, to a great extent, on conditions such as:

1. The quantity on hand and how flammable it is.
2. The probability of leakage or spills.
3. Is it exposed to air?
4. Is it in closed containers or a piping system?
5. Its location in relation to buildings or sources of ignition.
6. Is the fire protection adequate?

Most important however, the safety of any operation depends on people and their actions.

THE BULK PLANT (cont.)

CLASSIFICATION OF SOME TYPICAL BULK PRODUCTS

CLASS			FLASH POINT	BOILING POINT
I	A	**FLAMMABLES** Gasoline (some) Pentane	Lower Than 73°F	Lower Than 100°F
	B	Acetone Jet Fuel JP-4 Benzene Naphtha, VM and P Denatured Alcohol Crude Petroleum Gasoline (some) Toluene	Lower Than 73°F	At or Above 100°F
	C	Xylene	At or Above 73°F	
II		**COMBUSTIBLES** Camphor Oil Jet Fuel JP-6 Fuel Oil No. 1-D Kerosene Jet Fuel JP-5 Mineral Spirits Fuel Oil No. 2 Naphtha Fuel Oil No. 2-D Stoddard Solvent	At or Above 100°F	
III		**COMBUSTIBLES** Asphalt Fuel Oil No. 4 Brake Fluid Fuel Oil No. 5 Fuel Oil No. 6	At or Above 140°F	

NOTE: The flash point of a liquid is the lowest temperature at which it gives off enough vapors to form a flammable mixture with air near the surface of the liquid. Flammable liquids are defined as those having a flashpoint below 100°F, while combustible liquids are those with flashpoints at or above 100°F. Class I flammable liquids are categorized as IA, IB, or IC liquids according to flashpoints and boiling points. A liquid with flashpoint lower than 73°F and boiling point lower than 100°F is a Class IA liquid. Class IB liquids have a flashpoint below 73°F and a boiling point at or above 100°F. A Class IC liquid has a flashpoint at or above 73°F and below 100°F.

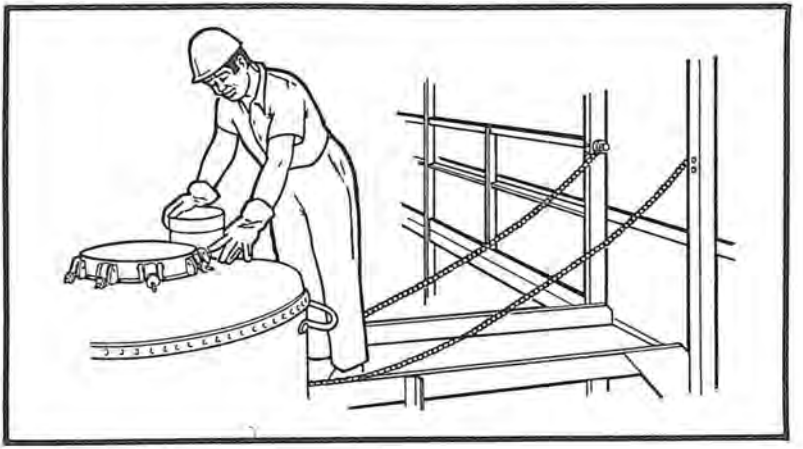
THE BULK PLANT (cont.)

The loading rack MUST be separated from tanks, warehouses, plant buildings, or the nearest property lines which could be used as building sites. The distance of separation of the rack from these structures depends upon the type of flammable liquid loaded on the rack. Class I liquids MUST be separated from these structures by 25 feet or more, and Class II and III liquids by at least 15 feet. This distance is measured from the nearest position of any fill spout. Buildings for pumps or shelters for personnel are considered part of the loading rack and are excluded from this requirement.

Piping, pumps, and meters used for the transfer of Class I liquids MUST NOT be used for Class II or III liquids.

Valves used for the final control for filling tank trucks MUST be of the self-closing hold open type except where there is an automatic system to shut off the flow when the vehicle is full.

The loading rack surface and associated stairs MUST be of a slip resistant material and present a good walking and working surface, free of tripping hazards. Stairs leading to the loading rack MUST be properly constructed and be fitted with stair railings. Where the loading rack platform is four or more feet from the ground, guard rails MUST be used except where the operator must move directly from the rack to the truck, and such railings would interfere with normal procedures.



THE BULK PLANT (cont.)

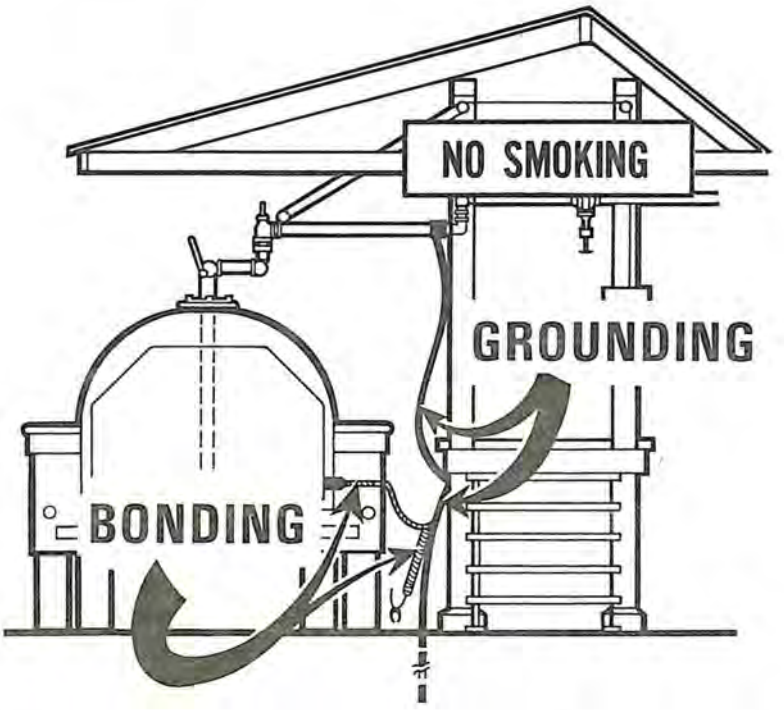
Bonding facilities for static protection during the loading of tank vehicles through open domes MUST be provided where Class I liquids are loaded, or where Class II or III liquids are loaded into vehicles containing vapors from previous cargoes of Class I liquids. Static bonding simply means that the fill spout and the vehicle are in electrical contact. Bonding is usually accomplished by providing a metallic bond wire connected to the rack structure which is in electrical contact with the fill spout and clamping the free end of the wire to a bare metal part of the vehicle chassis which is in electrical contact with the bucket box. Connections to the tank vehicle may be made with spring battery-type clamps which make firm contact with the vehicle chassis. Flexible connectors, such as braided ribbon or stranded wire of sufficient size to insure mechanical strength, corrosion resistance and flexibility are preferred to a solid conductor where bonds are connected and disconnected frequently. The bonding cable should be neatly stowed and readily available to the operator. A spring-loaded take-up reel is often helpful.

Additional protection against stray currents can be obtained by driving a metal ground rod at least eight feet into the earth and establishing electrical contact between this rod and the metal structure of the rack.

Static bonding is NOT REQUIRED where no Class I liquids are handled at the loading facility or where vehicles are loaded through closed bottom or top connections.

A tank truck being loaded or unloaded should have the engine shut off, the brakes set, lights off, and bonding connection in place before the dome cover is removed. Smoking by truck drivers SHALL NOT be permitted while loading or unloading the truck, making deliveries, driving the truck, or making repairs.

THE BULK PLANT (cont.)

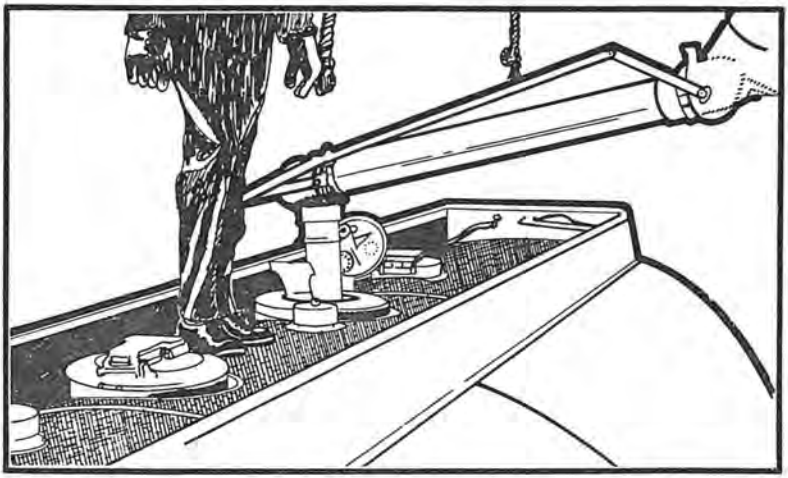


No smoking should be permitted within 20 feet of the rack in any direction where Class I or Class II liquids are loaded. The entire loading rack MUST be conspicuously posted as a "NO SMOKING" area where hazards from flammable liquids are present.

When filling through open domes, the downspout MUST extend near the bottom of the tank, if the vapor-air mixtures are within the flammable range and static charges can be accumulated.

Some concern for the acceptability of electrical equipment in the loading rack area is justified, especially if flammable liquids are being loaded. The loading of flammable liquids constitutes a Class I location and certain requirements for electrical equipment and connections apply.

THE BULK PLANT (cont.)



It is recommended that all electrical wiring in the loading rack area be either enclosed in threaded rigid metal conduit, or consist of mineral-insulated metal-sheathed cable, metal-clad cable, aluminum-sheathed cable, or shielded nonmetallic-sheathed cable. Lighting fixtures MUST be enclosed and protected from physical damage by suitable guards. Lights MUST be supported by structures of sufficient strength to brace against lateral displacement, and MUST be enclosed in explosion proof enclosures. Junction boxes, circuit breakers, fuse boxes, and switches MUST be enclosed.

Spills or overflows during loading should be avoided. If a spill does occur, loading should be stopped, valves shut off, and the spill cleaned up before loading is resumed. The flammable vapors should be allowed to dissipate before the engine is restarted.

If a fire breaks out during loading or unloading, the fuel supply to or from the truck should be shut off. The spout should not be removed, but if possible, the dome cover should be closed or the opening covered with a wet sack or blanket. Carbon dioxide, foam, or dry chemical extinguishers should be used to attack the fire. If burning vapors are escaping from a leak, it may be better to allow them to burn until the source of the escaping liquid or vapor can be controlled.

THE BULK PLANT (cont.)

Provisions MUST be made to ensure that flammable or combustible liquids do not enter public sewers, drainage systems, natural waterways, or become a hazard due to spills during operations. Spills can occur from tank rupture, valve and piping malfunction, or failure to follow procedures.

ABOVEGROUND STORAGE TANKS

Aboveground tanks are located according to the design and working pressure of the tank, their emergency venting capability installed (if any), the volume of the tanks, and the characteristics of the flammable or combustible contents. Because this publication is addressed to the smaller bulk plant operations, those liquids with boil-over characteristics and unstable liquids are not covered.

The tables below provide a means for calculating the minimum distance required between an aboveground storage tank and location of buildings to be protected. Table I is for tanks operating at or less than 2.5 pounds per square inch gauge (p.s.i.g.). Table 2 is for tanks operating at pressures exceeding 2.5 p.s.i.g. In some instances Tables 1 and 2 make reference to Table 3 to obtain the minimum distance.

"Protection for exposures" means that adequate fire protection for structures near the tanks MUST be provided, where there are employees.

ABOVEGROUND STORAGE TANK LOCATIONS

TABLE 1

Type of tank	Protection	Minimum distance in feet from property line which may be built upon, including the opposite side of a public way	Minimum distance in feet from nearest side of any public way or from nearest important building and shall be not less than five feet
Floating roof	Protection for exposures.	½ times diameter of tank but need not exceed 90 ft.	1/6 times diameter of tank but neet not exceed 30 ft.
	None	Diameter of tank but need not exceed 175 ft.	1/6 times diameter of tank but need not exceed 30 ft.
Vertical with weak roof to shell seam.	Approved foam or inerting system on the tank.	½ times diameter of tank but need not exceed 90 ft. and shall not be less than 5 ft.	1/6 times diameter of tank but need not exceed 30 ft.
	Protection for exposures.	Diameter of tank but need not exceed 175 ft.	1/3 times diameter of tank but need not exceed 60 ft.
	None	2 times diameter of tank but need not exceed 350 ft.	1/3 times diameter of tank but need not exceed 60 ft.
Horizontal and vertical, with emergency relief venting to limit pressures to 2.5 p.s.i.g.	Approved inerting system on the tank or approved foam system on vertical tanks.	½ times Table 3 but shall not be less than 5 ft.	½ times Table 3.
	Protection for exposures.	Table 3	Table 3.
	None	2 times Table 3	Table 3.

TABLE 2

Type of tank	Protection	Minimum distance in feet from property line which may be built upon, including the opposite side of a public way	Minimum distance in feet from nearest side of any public way or from nearest important building
Any type	Protection for exposures.	1½ times Table 3 but shall not be less than 25 ft.	1½ times Table 3 but shall not be less than 25 ft.
	None	3 times Table 3 but shall not be less than 50 ft.	1½ times Table 3 but shall not be less than 25 ft.

TABLE 3

Capacity tank gallons	Minimum distance in feet from property line which may be built upon, including the opposite side of a public way	Minimum distance in feet from nearest side of any public way or from nearest important building
275 or less	5	5
276 to 750	10	5
751 to 12,000	15	5
12,001 to 30,000	20	5
30,001 to 50,000	30	10
50,001 to 100,000	50	15
100,001 to 500,000	80	25
500,001 to 1,000,000	100	35
1,000,001 to 2,000,000	135	45
2,000,001 to 3,000,000	165	55
3,000,001 or more	175	60

THE BULK PLANT (cont.)

TANK VENTING

The normal venting of aboveground storage tanks is intended to prevent the development of vacuum or pressure during filling and emptying and MUST be sized accordingly. The vents for tanks storing Class I liquids adjacent to buildings or public ways SHALL discharge at least 12 feet above ground level and be at least as large as the filling or withdrawal connection(s), whichever is larger, but in no case less than 1¼ inch inside diameter. American Petroleum Institute Standard 2000 (1968), *"Venting Atmospheric and Low Pressure Storage Tanks"*, may be helpful in determining whether your tanks are adequately vented.

Emergency relief venting for fire exposure is intended to relieve excessive internal pressure caused by exposure fires. This relief venting may take the form of a floating roof, lifter roof, a weak roof-to-shell seam, or other approved pressure relieving devices. The total capacity of both normal and emergency vents shall be sufficient to prevent tank rupture. Each commercial tank venting device SHALL have stamped on it the opening pressure, the pressure at which the valve reaches full open position, and the flow capacity at the latter pressure, expressed in cubic feet per hour of air at 60°F and a pressure of 14.7 pounds per square inch absolute (p.s.i.a.).

DRAINAGE AND DIKING

The area surrounding a tank or group of tanks MUST be provided with either drainage or diking to prevent accidental discharge of liquid from endangering adjoining property or reaching waterways.

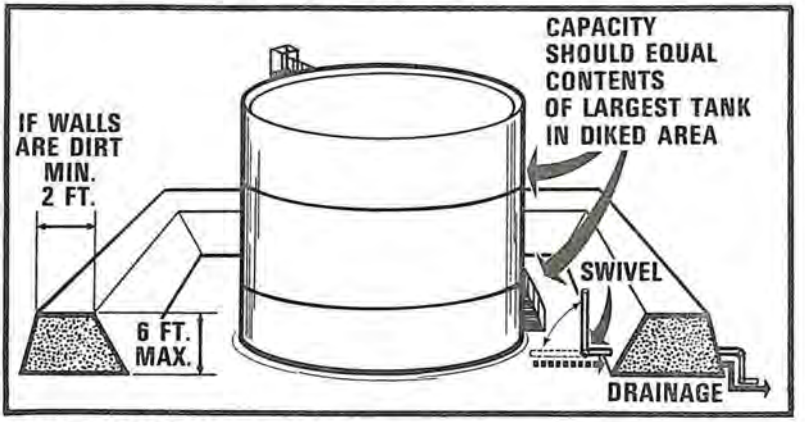
If **drainage** is used:

1. The slope SHALL be not less than one percent.
2. The drainage path and destination MUST be located so that if the escaping liquids were ignited the fire will not seriously expose tanks or adjoining property.
3. The impoundment area MUST be large enough to accommodate the largest tank served.

THE BULK PLANT (cont.)

If **diking** is the method employed:

1. The capacity of the diked area MUST be large enough to contain the contents of the largest tank in the diked area.
2. The dike walls SHALL NOT be more than six feet average height above interior grade and if made of dirt, SHALL have a flat section at the top of not less than two feet wide if the walls are three feet or more in height.
3. No loose combustible material or drums are permitted in the diked area.
4. Control of drainage of the diked area SHALL be accessible during fire conditions.



UNDERGROUND STORAGE TANKS

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

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

Underground storage tanks have specific venting requirements for Class I liquids. Vent pipes are to be placed so that

THE BULK PLANT (cont.)

the point of discharge is outside of all buildings. The vent pipe MUST be higher than the fill pipe opening and not less than 12 feet above the surrounding ground level. Vent pipes SHALL only discharge upward in order to disperse vapors. If the pipe is two inches or less (inside diameter), devices that will obstruct and cause excessive back pressure SHALL NOT be used. Vent pipe outlets SHALL NOT be located where vapors can enter buildings or be captured under eaves or other obstructions.

REPAIRING AND CLEANING TANKS

If proper precautions are not observed, the cleaning or repair of storage tanks which have contained gasoline or petroleum products can be very dangerous. Some important procedures to be used when cleaning or repairing tanks follow:

1. Ventilate the tank.

2. Wash out the tank with water. The objective is to displace flammable vapors thereby reducing the chances of an explosion. A portable flammable-vapor indicator should be used throughout the cleaning process in order to assure safe levels of vapor.

3. Remove any remaining sludge or other deposits. A respirator may be required to prevent excessive exposures to vapors or dusts.

   Detergents may be used with caution. Under certain conditions there is the possibility of an explosion should a caustic solution react with certain residues.

4. Before welding is to be done, the tank should first be filled with an inert gas such as carbon dioxide or water.

THE BULK PLANT (cont.)

5. If welding inside a tank, special precautions are necessary.

   a. A worker MUST be stationed outside the tank at the manhole. His purpose is to constantly observe the welder and be ready, with proper personal protective equipment, at all times to help the welder in case of an emergency.

   b. The welder should be equipped with either a self-contained breathing apparatus or a supplied-air respirator.

   c. If a supplied air or self-contained breathing apparatus is not used, the atmosphere inside the tank MUST be continuously monitored to ensure there is adequate oxygen.

   d. The welder or any persons working inside the tank MUST be equipped with means (e.g., harness and life-line) to facilitate removal in an emergency.

6. Shut down any nearby hazardous operations and move any flammables from the area before repairs are started.

PUMPING AND PIPING SYSTEMS

A closed piping system is the safest method to move quantities of flammable liquids. However, serious accidents do take place even with this system.

Usually these accidents result from a faulty operation which allows flammable liquid to escape or faulty design or maintenance.

Pump motors 18 inches or less from the ground and within 10 feet of piping, meters, and withdrawal fittings MUST be enclosed or explosion-proof. Motors MUST be grounded.

Separate pipelines and pumps MUST be maintained for each class of product. Color coding and labeling the pumps and manifold eliminates confusion and prevents mistakes.

THE BULK PLANT (cont.)

EMPLOYEE TRAINING

The safe operation of any bulk plant is largely dependent on employees who are properly informed, and aware of potential hazards and are capable of coping with emergencies.

The training needed will vary according to the complexity of the plant. At the very least, all personnel should be thoroughly indoctrinated in the hazards of the operation.

A good start would be to:

1. Impress upon the worker the need for constant awareness—even during automatically controlled operations.
2. Be sure employees (both old and new) know how to use personal protective equipment.
3. Develop and maintain check points to be observed (as part of the routine) during each shift.
4. See that employees have available a printed list of standard procedures and emergency procedures.
5. Post signs showing emergency shutoffs.
6. Instruct employees in the use of portable fire extinguishers. (Refer to fold-out chart in this booklet and post in a conspicuous place).
7. Set up a first aid training program for employees.
8. Instruct employees in safe lifting practices. (Refer to fold-out chart.)

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WALKING AND WORKING SURFACES

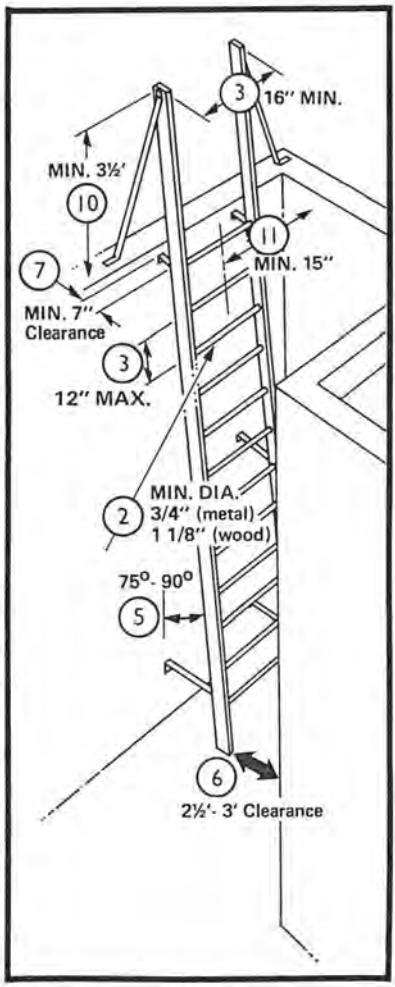
GENERAL REQUIREMENTS

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, it is suggested that a competent engineer be consulted. These floor load capacities MUST be posted in a readily visible location (except for slab floors with no basements).

WALKING AND WORKING SURFACES (cont.)

FIXED LADDERS **MUST:**

1. Be designed to withstand a single concentrated load of at least 200 pounds.
2. Have rungs with a minimum diameter of ¾ inches for metal ladders, or 1⅛ inches for wood ladders.
3. Not have rungs spaced more than 12 inches apart and MUST be at least 16 inches wide.
4. Be painted (if metal), or otherwise treated to resist deterioration when location demands.
5. Have a preferred pitch of 75°-90° for safe descent.
6. Have 2½ foot clearance for ladders with 90° pitch and three 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 30 feet.
9. Have landing platforms if they are longer than 30 feet. 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).



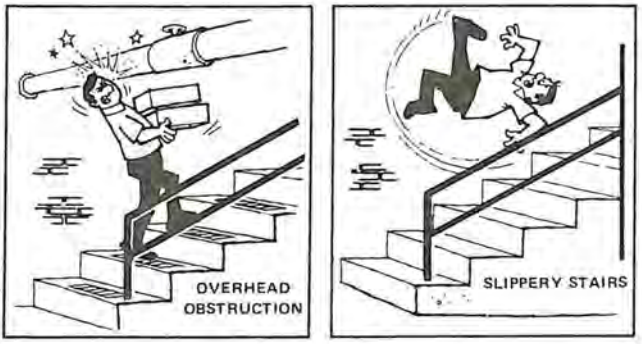
WALKING AND WORKING SURFACES (cont.)

PORTABLE LADDERS:

1. MUST be maintained in good condition at all times.
2. Should be kept coated with a suitable protective material.
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. If wooden, 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 placed so 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:

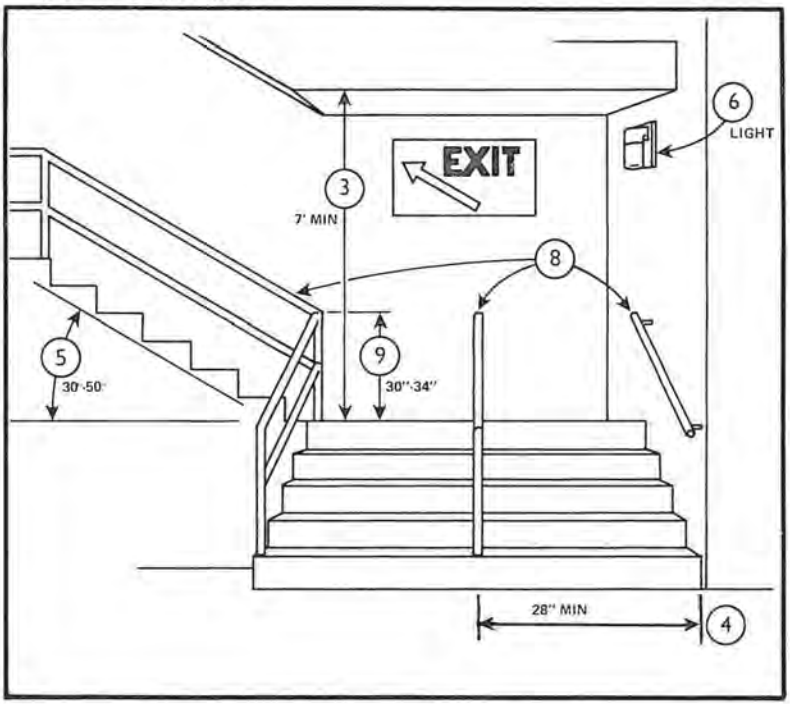
1. Riser height and tread width MUST be uniform throughout any flight of stairs.
2. All treads MUST be reasonably slip resistant.
3. Vertical clearance above any stair tread to any overhead obstruction MUST be at least seven feet, measured from the leading edge of the tread.



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

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. If the flight of stairs has four or more risers:
   a. a stair railing on each open side is REQUIRED.
   b. a hand rail on each enclosed side is REQUIRED if greater than 44 inches wide.
   c. and both sides are enclosed on a stairway less than 44 inches wide, at least one handrail is REQUIRED, preferably on the right side descending.
   d. and if the stairway is 88 or more inches wide, an intermediate stair railing located midway is 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.



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" 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 ⅜-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.

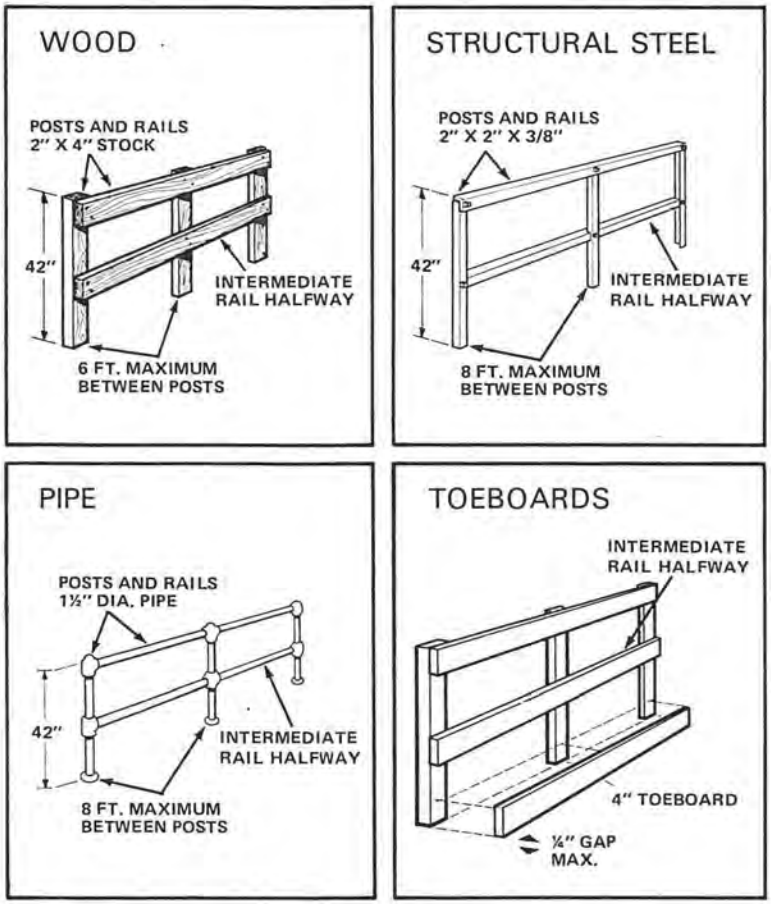
2. Every stairway floor opening MUST be guarded on all exposed sides except the entrance to the stairway.

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 runway or catwalk MUST have railings on all open sides four feet or more above ground or floor level.

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).



NIOSH

EXITS AND EXIT MARKINGS

EXITS AND EXIT MARKINGS

1. Every exit MUST have the word "EXIT" in plain legible letters not less than six inches high with the strokes of the letters not less than ¾ inches wide.
2. Doors, passageways, or stairways which are neither exits nor ways to an exit, but may be mistaken for an exit, MUST be clearly marked "NOT AN EXIT" or marked by a sign indicating their actual use e.g., "STORAGE ROOM", "TO BASEMENT", etc.

3. When the direction to the nearest exit may not be apparent to an occupant, an exit sign with an arrow indicating direction should be used.
4. Exit access should be arranged so that is 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.

EXITS AND EXIT MARKINGS (cont.)

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

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

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL

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 decibles 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.

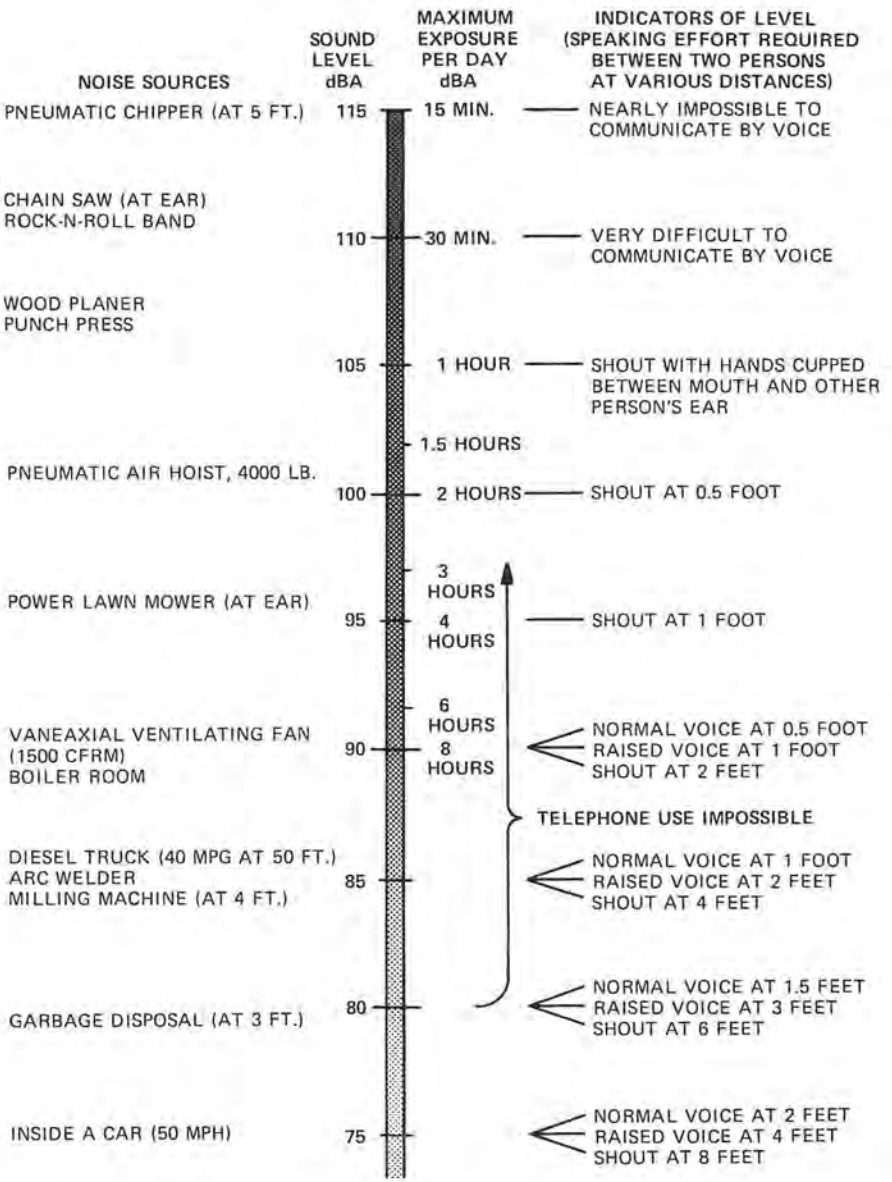
At greater than 90 dBA exposures (eight hours per day) or for higher noise levels in excess of the allowable time (e.g., 100 dBA for more than two hours) a continuing, effective hearing conservation program MUST be administered. Reference to the following table gives estimates of noise levels and the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

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL (cont.)

PERMISSIBLE NOISE EXPOSURES



HAZARDOUS MATERIALS

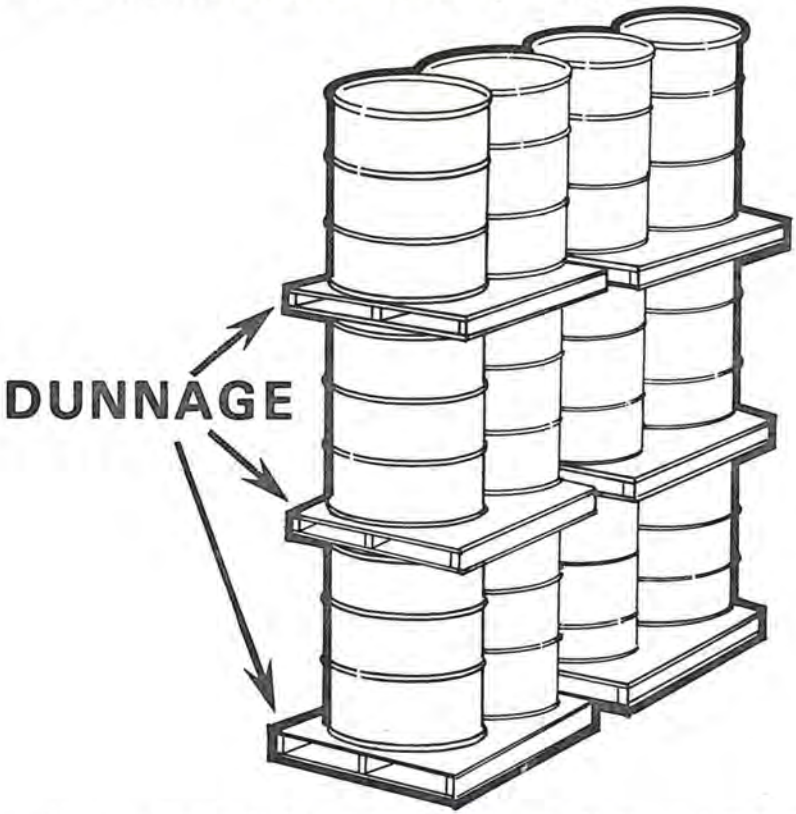
MATERIAL STORAGE

The typical bulk plant incorporates one or more storage areas designated for products and accessories in addition to the main storage tanks for bulk petroleum or gasoline. These areas characteristically house tires, batteries, motor oil in cases and drums, small quantities of solvents, and assorted automobile accessories.

The primary problem confronting the warehouse supervisor (or person responsible for the storage area) is maintaining a neat and orderly area for both temporary and permanent storage. Proper planning of material storage areas demands that the material not obstruct fire extinguishers, fire alarm boxes, automatic sprinkler heads, sprinkler system controls, electric switches, lights, first aid equipment, or exits. Safe clearances MUST be allowed for aisles, at loading docks, through doorways and whenever turns or passage must be made. All permanent aisles and passageways MUST be appropriately marked, preferably with lines on the floor. Proper drainage MUST be provided and clearance limits SHALL be marked.

Indoor storage of Class I (flammable) liquids should be limited to closed, vaportight containers of less than 60 gallons capacity. The arrangement of the drums should be such that piles of material are separated by aisles of sufficient width to permit easy access in case of leakage or fire. Containers of flammable or combustible liquids when piled one upon the other, MUST be separated by pallets or dunnage sufficient to provide stability and to prevent excessive stress on container walls.

HAZARDOUS MATERIALS (cont.)



Rooms in which flammable liquids are stored or handled MUST be heated by means which does not constitute a source of ignition, such as steam or hot water. If Class I liquids are pumped or dispensed in a room, ventilation MUST be provided, either by adequate openings in outside walls or by mechanical ventilation equipment. Class I liquids MUST NOT be stored or handled within a building having a basement or pit into which flammable vapors may travel unless such area is provided with ventilation designed to prevent the accumulation of flammable vapors.

Rooms in which flammable or combustible liquids are stored or handled by pumps MUST have exit facilities arranged to prevent occupants from being trapped in the event of a fire. These exits MUST be clearly marked and maintained unobstructed.

HAZARDOUS MATERIALS (cont.)

STORAGE OF HAZARDOUS MATERIALS

Hazardous materials REQUIRE special storage and handling due to one or more of the following:

1. Low-ignition temperatures
2. Corrosive or toxic influences
3. Susceptibility to spontaneous combustion

Hazardous materials which may react dangerously MUST be segregated. For instance, combustible materials MUST be kept away from oxidizing agents, such as battery acids.

Great care should be exercised in the handling of these materials in order to prevent breaking or rupturing the containers. All containers should be thoroughly checked for leaks before placing them in storage.

Any container that has been opened MUST be resealed. If for any reason leakage occurs, the damaged container MUST be removed from the storage area and any resultant spillage immediately cleaned up.

FLAMMABLE GASES

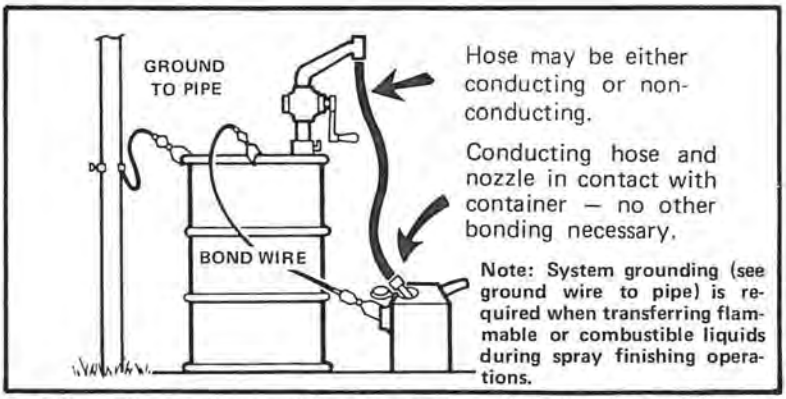
Flammable gases should be segregated from all other storage—particularly oxidizing gases such as oxygen. They MUST be kept in a well ventilated area and should be protected with an automatic sprinkler system. Even though the sprinklers will not extinguish a flammable gas fire—the water will serve to cool cylinders that are not involved in the fire.

HAZARDOUS MATERIALS (cont.)

FLAMMABLE AND COMBUSTIBLE LIQUIDS

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

1. Connections on all drums and piped flammable and combustible liquids MUST be vapor-and-liquid tight.
2. When flammable liquids are transferred from one container to another, for example, from one bulk container to another, 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.
4. Supplies of flammable and combustible liquids MUST be stored in approved fire-resistant safety containers. These containers can be purchased from 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 or paint rags, MUST be stored in covered metal containers and be disposed of daily.

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 constitute hazards for which personal protective devices for the eyes, face, head, and extremities, as well as protective clothing and respiratory devices, are required. Furthermore, it MUST be safely designed and sufficiently well-constructed to provide the protection for which it is intended.

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

EYE PROTECTION

Eye protection is REQUIRED where there is a possibility of an eye injury from flying particles, chips, and corrosive materials. Employees MUST wear eye protection when using grinders, power drills, and other similar equipment.

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.

FOOT PROTECTION

Foot protection is REQUIRED to prevent injury from falling objects. Particularly in receiving and transferring inventory, experience has shown that precautions are needed against falling items.

HEAD PROTECTION

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

HEARING PROTECTION

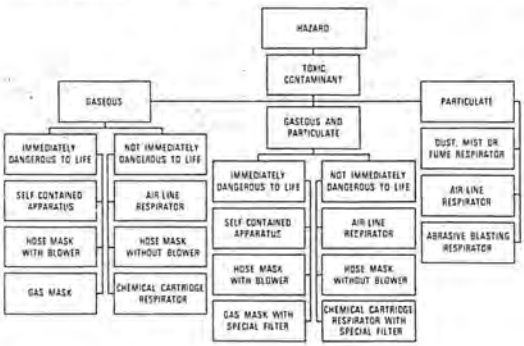
Appropriate hearing protection MUST be available to personnel, and used, where noise levels are in excess of the maximum exposure per day. (See **OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL.**) Such sound intensity is likely to occur around powerful motors or high speed tools.

PERSONAL PROTECTIVE EQUIPMENT (cont.)

RESPIRATORY PROTECTION

NIOSH-approved respirators MUST be provided by the employer when air is contaminated with harmful dusts, fumes, mists, gases, or vapors. When respirators are used a respirator program MUST be established and include the following requirements:

1. Respirators designed to protect against the specific hazards to which the worker is exposed MUST be selected.
2. Written instructions covering selection, cleaning, 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 uses.
6. All straps are tied and adjusted.
7. A good face seal—beards, sideburns, glasses may interfere.
8. Filters are replaced when an employee can smell vapors in the mask, when breathing becomes difficult, or when the respirator has been used for the specified lifetime of the cartridge.

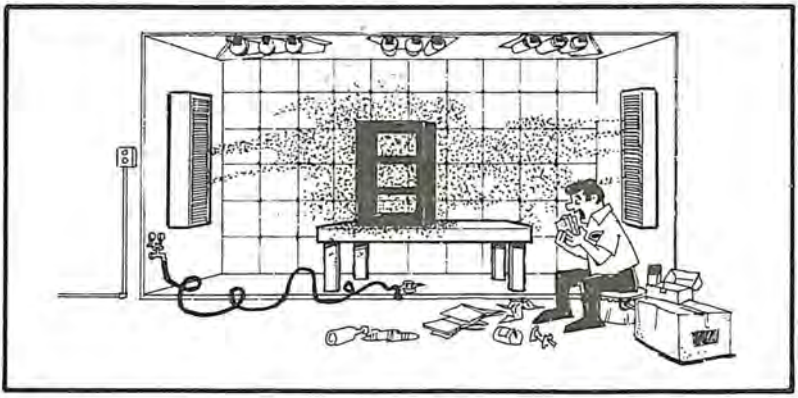


NIOSH

GENERAL ENVIRONMENTAL CONTROLS

Federal Standards for Occupational Safety and Health which apply to your place of business REQUIRE that:

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.

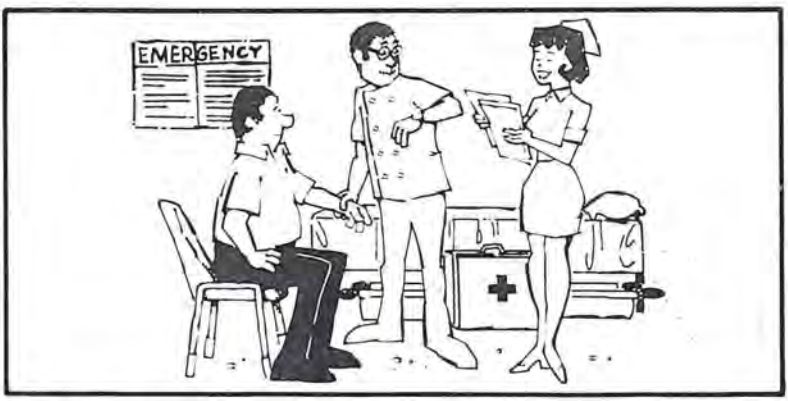


7. Beverages or food MUST NOT be stored or consumed in a toilet room or in an area exposed to materials which could be hazardous if ingested.
8. Employees working with hazardous substances should wash and remove contaminated clothing before eating, drinking, or smoking.

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 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 with OSHA approved programs provide acceptable training.

MEDICAL AND FIRST AID (cont.)

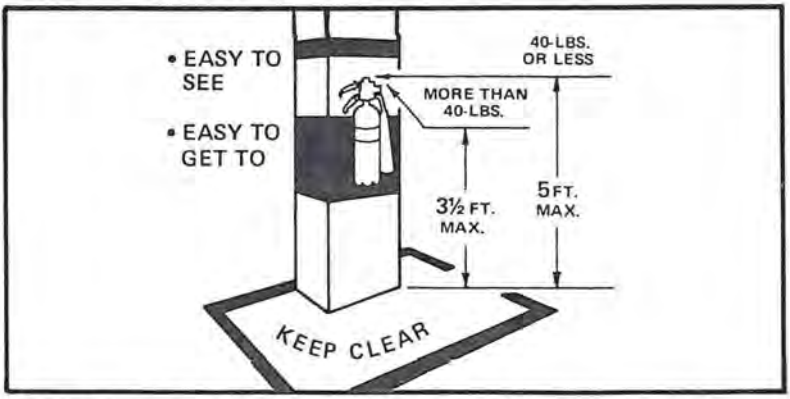
2. **First aid supplies MUST be readily available and approved by a consulting physician.** These supplies should be in sanitary containers with individually sealed packages for material such as gauze, bandages, and dressings that MUST be sterile. Other items often needed are adhesive tape, triangular bandages (to be used as slings), inflatable plastic splints, scissors, and mild soap for cleansing of wounds or cuts.
3. **Suitable facilities for quick drenching or flushing of the eyes and body MUST be provided within the work area when a person may be exposed to injurious corrosive materials.**

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.

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

Reference to **RECORDKEEPING REQUIREMENTS** toward the back of this Guide gives a discussion of records which MUST be maintained for occupational injuries and illnesses.

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 5 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 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.

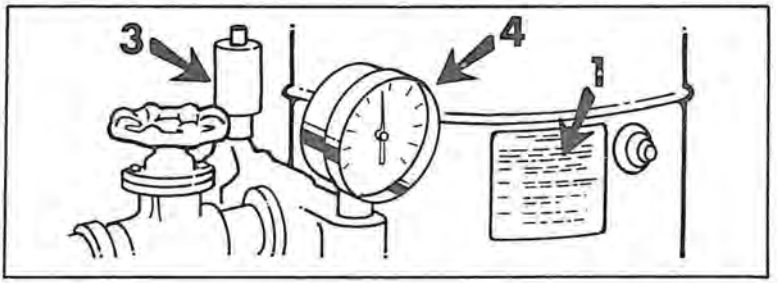
A chart showing fire extinguishers by class and how to use them is located in the back of this booklet.

NIOSH

COMPRESSED AIR EQUIPMENT

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

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



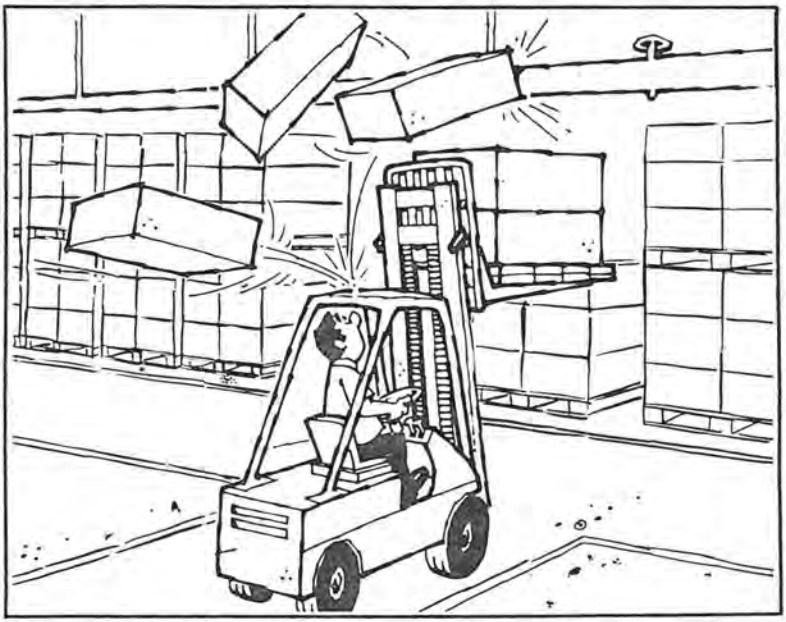
2. The drain valve on the air tank should be opened frequently to prevent excessive accumulation of liquid.
3. Air tanks MUST be protected by adequate safety-relief valve(s). These valves MUST be tested at regular intervals to be sure they are in good operating condition.
4. The pressure controller and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

MATERIALS HANDLING AND STORAGE

POWERED INDUSTRIAL TRUCKS

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

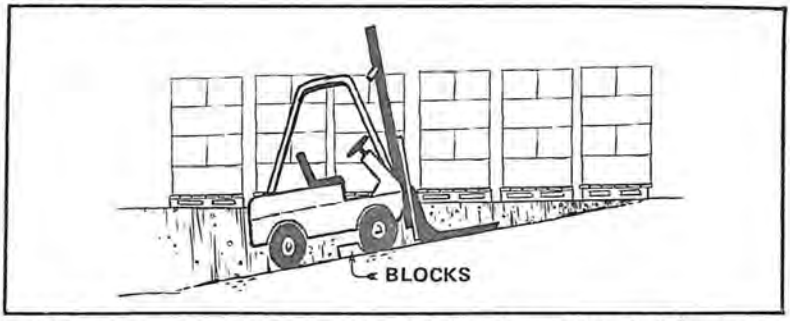
High-lift-rider trucks MUST be fitted with an overhead guard.



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.*

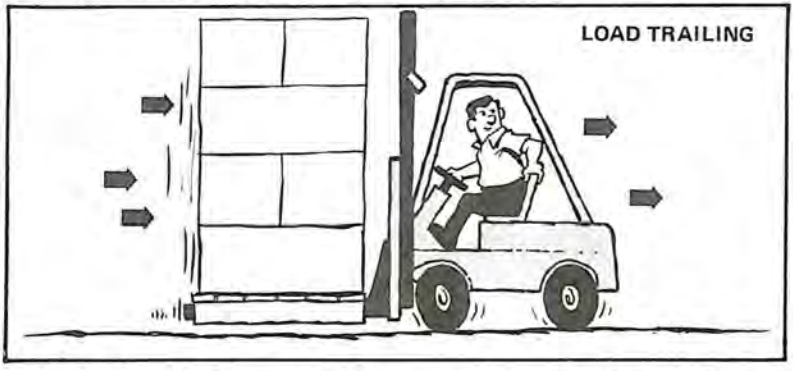
If battery-operated equipment is used, the battery charging area is to be designated with a "NO SMOKING" sign due to the hydrogen gas emitted during the charging process.

MATERIALS HANDLING AND STORAGE (cont.)



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

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



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

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

NIOSH

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.

HYDRAULIC LIFT SKID TRUCKS

A hydraulic lift truck that shows signs of leaking should be taken out of service until it can be repaired. The leaking can cause the truck to settle after the load is raised thereby becoming a hazard.

HAND TRUCKS

Operators of hand trucks should wear gloves and safety shoes. The most frequent injuries of hands and feet may then be easily avoided. Also, hand trucks should be fitted with knuckle guards to prevent jamming the hands into obstructions.

NIOSH

MACHINERY AND MACHINE GUARDING

GENERAL REQUIREMENTS FOR MACHINE GUARDING

1. Guards MUST be attached to the machine if possible. The guard should be such that it does not constitute a hazard.
2. 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.
3. All belts, pulleys, chains, sprockets, and gears MUST be effectively guarded.
4. All belts, chain drives, shafting, couplings, keys, collars, or 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.
5. 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.

Certain guarding methods are preferable to others, and 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 method 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.

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.

NIOSH

MACHINERY AND MACHINE GUARDING (cont.)

Guarding devices MUST prevent the operator from having any part of the body in the danger zone during the operating cycle. A booklet entitled *"The Principles and Techniques of Mechanical Guarding"*, OSHA 2057, can be obtained by writing to 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:

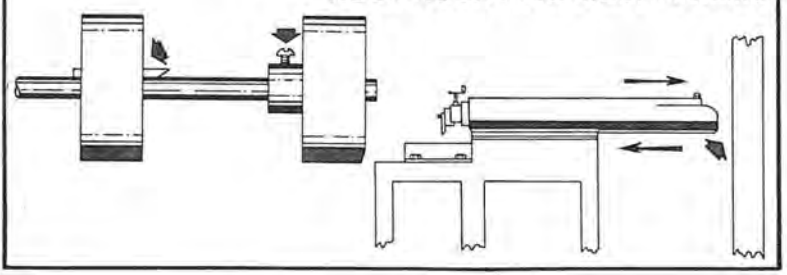
1. Enclosing the operation (preferred)
2. Interlocking devices
3. Moving barriers
4. Removal devices
5. Remote control
6. Two-hand tripping devices
7. Electronic safety devices

The following are examples of specific equipment that MUST be guarded. This listing is not intended to include all equipment that may require guarding.

ROTATING AND RECIPROCATING MOTION

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.

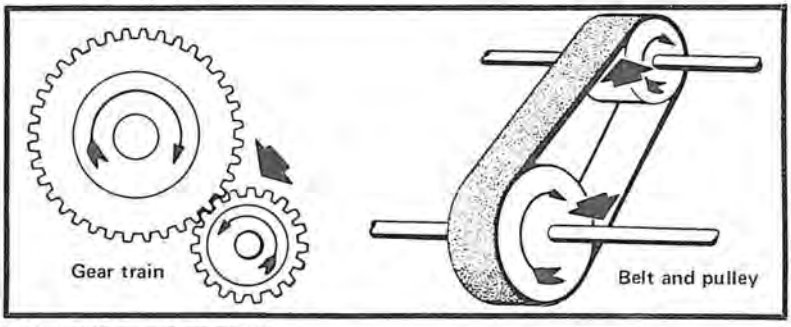
EXAMPLES OF TYPICAL ROTATING AND RECIPROCATING MECHANISMS



MACHINERY AND MACHINE GUARDING (cont.)

IN-RUNNING NIP POINTS

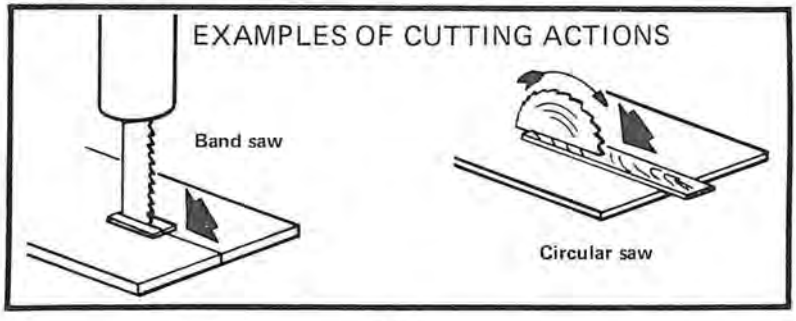
In-running nip points are a special danger existing only through action of rotating objects. Whenever machine parts rotate toward each other, or where one rotates toward a stationary object, an in-running nip point is formed. Objects or parts of the body may be drawn into this nip point and be bruised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



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, boring or drilling machines, and grinding machines.



NIOSH

MACHINERY AND MACHINE GUARDING (cont.)

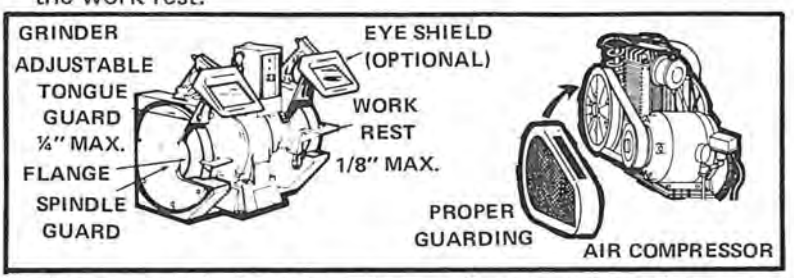
GRINDERS

Requirements:

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

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

   When measuring the guard opening, the visors or other accessory equipment are not included as a part of the guard unless this accessory equipment is as strong as the guard.
2. **Work or Tool Rests**—These rests MUST be of strong construction and designed to be adjustable to compensate for wheel wear. Work rests MUST be closely adjusted to the wheel, with a maximum clearance of 1/8 inch, to prevent the work from becoming jammed between the wheel and the work rest.



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

FANS

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

AIR COMPRESSORS

MUST have their flywheel and drive pulley **fully enclosed.**

NIOSH

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.

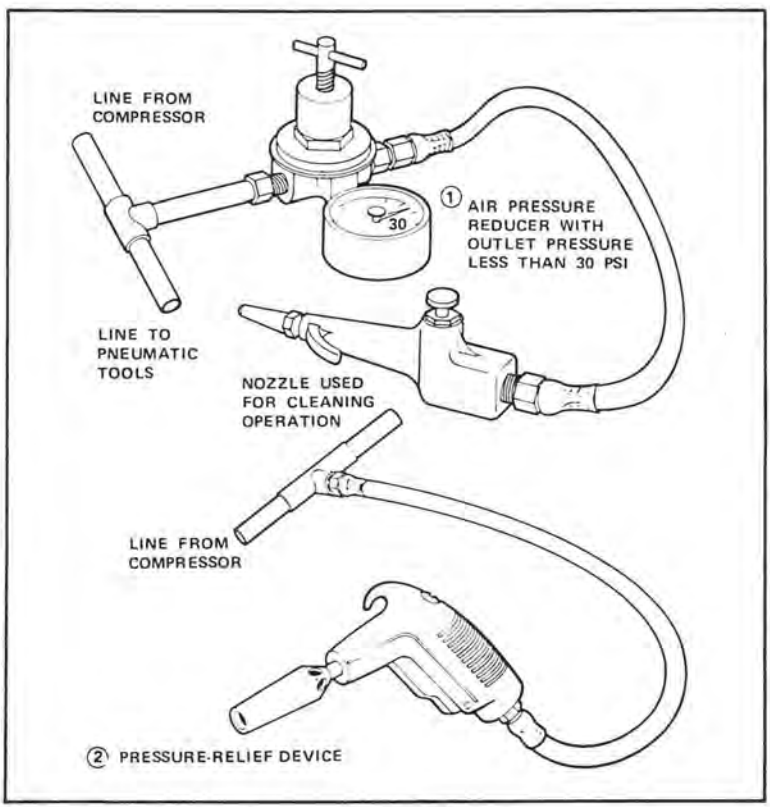
2. Hammers with broken or cracked handles, chisels and punches with mushroomed heads, or bent or broken wrenches should NOT be used.
3. Most hand-held powered tools MUST be equipped with a dead-man control or quick release so that the power is automatically shut off whenever the operator releases the control.
4. Portable circular saws and portable grinders MUST be equipped with guards above and below the base plate or shoe. The lower guard MUST retract when the blade is in use and automatically return when the tool is withdrawn from the work.
5. All hand-held portable electrical equipment MUST have its frame grounded or be doubly insualted and identified as such.

NIOSH

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 "below 30 psi" requirement are illustrated below.



NIOSH

HAND AND PORTABLE POWERED TOOLS (cont.)

SAFETY RULES FOR OPERATING POWER TOOLS

Employees should be instructed to:

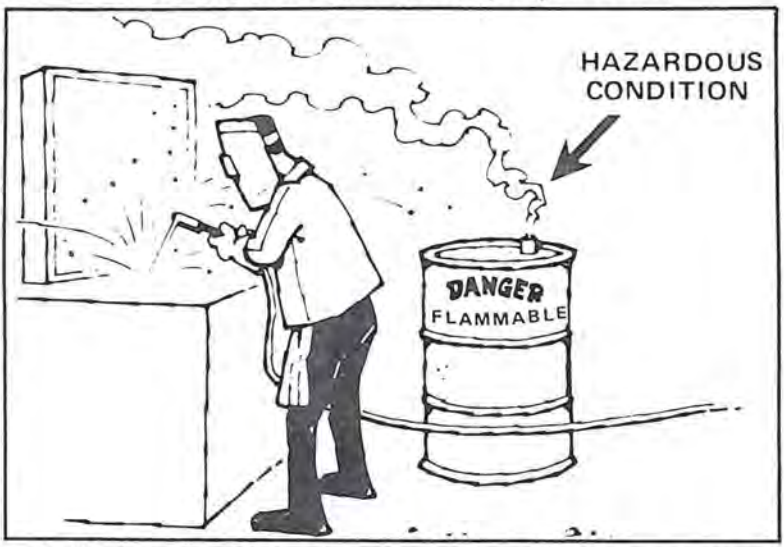
1. Know the application, limitations, and potential hazards of the tool.
2. Select the proper tool for the job.
3. Remove adjusting keys and wrenches before turning on tools.
4. Keep guards in place and in working order and not to remove ground prongs.
5. Keep working areas free of clutter that can be a tripping hazard.
6. Keep alert to potential hazards in the working environment such as damp locations or the presence of highly combustible materials.
7. Not use tools with frayed cords.
8. Dress properly to avoid loose clothing catching in moving parts.
9. Use safety glasses, dust or face masks, or other protective clothing and equipment if the operation requires it.
10. Not surprise or distract anyone using a power tool. Horseplay frequently causes injuries.

NIOSH

WELDING, CUTTING, AND BRAZING

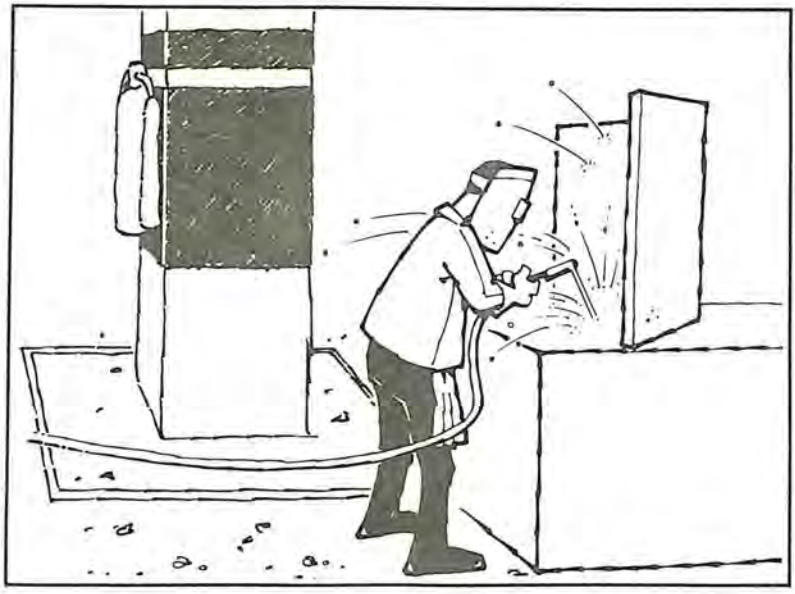
GENERAL

1. 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.



2. Cutting or welding is not permitted in the presence of explosive atmospheres which may develop inside or near uncleaned or improperly prepared tanks or equipment.
3. The atmosphere in the welding area MUST be free of flammable gases, liquids, and vapors.
4. Individual booths or noncombustible screens MUST be provided to enclose the welder when other persons may be in the vicinity.
5. Proper eye protection MUST be worn by welders and adjacent persons exposed to flash.
6. General ventilation or local exhaust ventilation MUST be provided when:
   a. There is less than 10,000 cubic feet of volume per welder.
   b. The ceiling is less than 16 feet high.
   c. Welding is done in confined spaces.

WELDING, CUTTING, AND BRAZING (cont.)



7. Suitable fire extinguishing equimpent MUST be handy.
8. Respirators may be needed when:
   a. Doing welding over prolonged periods or at frequent intervals.
   b. Mechanical ventilation is not provided.
   c. Welding on metals that produce toxic fumes.
   d. Welding on metals that are coated with materials that produce toxic fumes (e.g., lead paint, cadmium plated metals, etc.).
9. It is NECESSARY to mark any hot metal with soap stone or in some other way to warn workers.
10. Exposure to the welder from harmful levels of gases and metal fumes depends on the toxicity of the materials involved, the current intensity, the time spent welding, and the adequacy of ventilation. The suppliers of welding materials MUST determine any hazard associated with the use of their products and provide a precautionary label. These instructions should be followed.

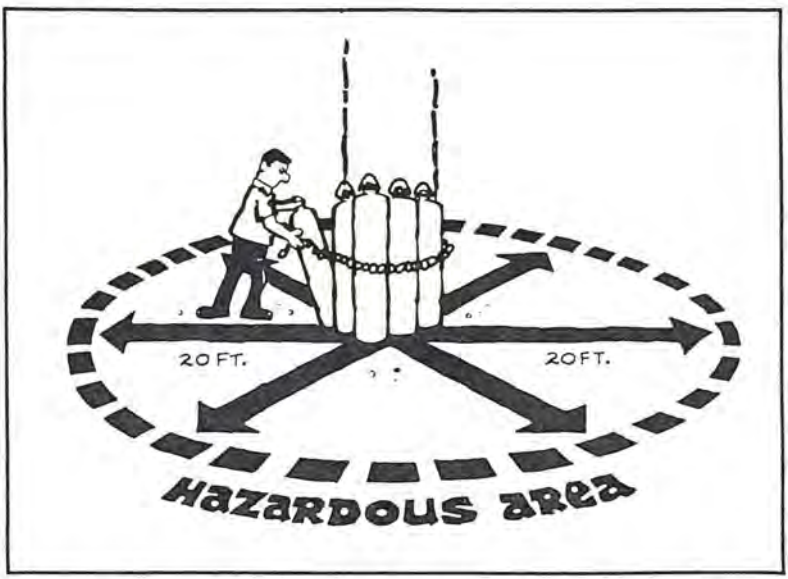
NIOSH

WELDING, CUTTING, AND BRAZING (cont.)

GAS WELDING

It is REQUIRED that:

1. All cylinders are away from radiators and other sources of heat.



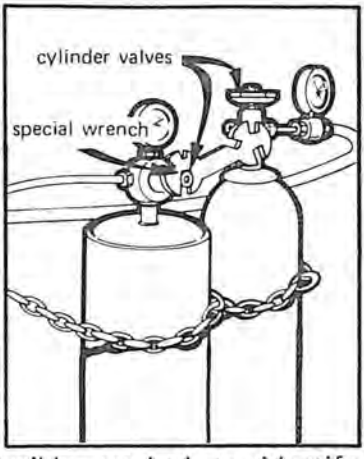
2. All cylinders stored inside buildings are located in a well-protected, well-ventilated, dry location at least 20 feet from highly combustible materials and away from elevators, stairs, or gangways. They are not to be kept in unventilated enclosures such as lockers and cupboards.

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.

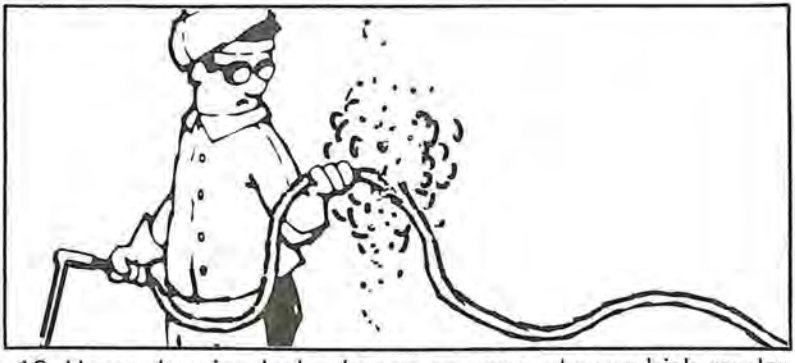
4. Stored oxygen cylinders are separated from stored fuel gas cylinders or combustible materials (especially oil or grease) by a minimum distance of 20 feet or by a non-combustible barrier at least five feet high and having a one-half hour fire resistance rating.

WELDING, CUTTING, AND BRAZING (cont.)

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



6. All cylinders MUST be legibly marked to identify contents.
7. No cylinder should be permitted to stand alone without being secured with lashing or chain to prevent it from toppling over.
8. Acetylene MUST NOT be utilized at a pressure in excess of 15 psi gauge (or 30 psi absolute).
9. Indoor storage of fuel gas in cylinders is limited to a total capacity of 2,000 cubic feet or 300 pounds of liquefied petroleum gas.



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

NIOSH

WELDING, CUTTING, AND BRAZING (cont.)

ELECTRIC ARC WELDING

1. If the welding machine is wet, it MUST be thoroughly dried and tested before it is used again.
2. Coiled welding cable is to be spread out; the ground lead MUST be firmly attached to the work.
3. Cables MUST be inspected for damage and loss of insulation and be repaired immediately.
4. Ground and electrode cables may be joined together only with connectors specifically designed for that purpose.
5. Cables with splices within 10 feet of the operator may not be used; neither may the operator coil cables around his body.
6. Welding helmets or hand shields MUST be worn by the operator. Persons close by MUST wear eye protection.
7. Shields MUST protect others in the vicinity from arc welding rays.
8. Arc welders should wear clean, fire-resistant gloves and clothing with collars and sleeves buttoned.
9. Electrode holders which are not in use MUST be placed in a safe place, for example, away from conducting objects.

THE NATIONAL ELECTRICAL CODE (NEC)

ELECTRICAL REQUIREMENTS

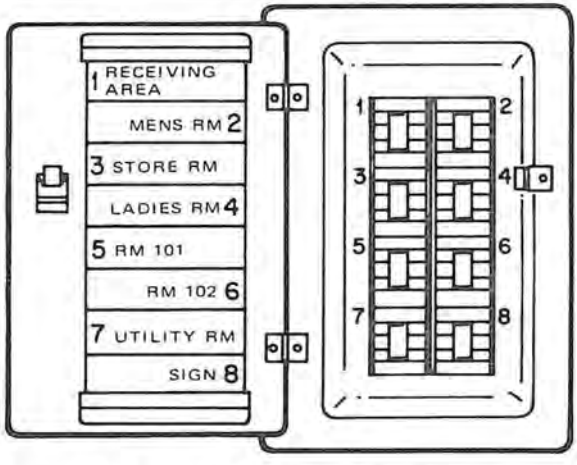
MORE FIRES ARE CAUSED BY ELECTRICAL MALFUNCTION THAN ANY OTHER CAUSE, and standards pertaining to electrical equipment and use in all industries have been cited as violations more frequently than any others.

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 any persons and of 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.

Standards pertaining to electrical equipment and use have been cited as violations more frequently than any others.

IT IS REQUIRED THAT:

1. Each disconnecting means for motors and appliances MUST be legibly marked to indicate its purpose unless its purpose is evident.

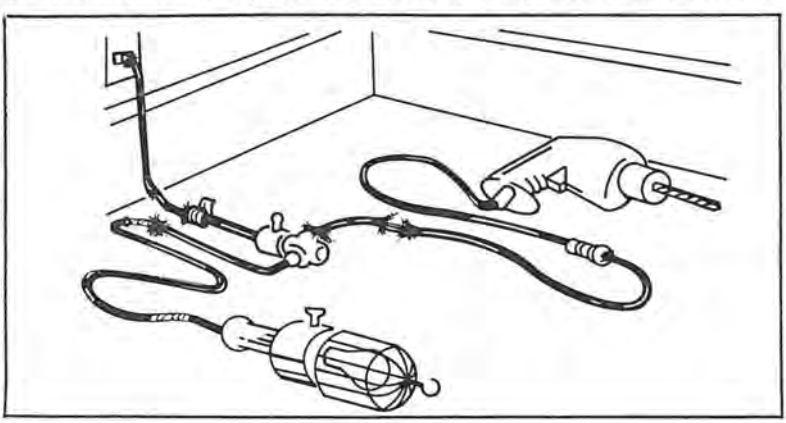


Proper labeling of circuit breakers.

NIOSH

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.
4. Exposed noncurrent-carrying metal parts of the following plug-connected equipment which are liable to become energized, MUST be grounded.
   a. Portable hand-held motor-operated tools.
   b. Appliances.
   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.

THE NATIONAL ELECTRICAL CODE (NEC) (cont.)

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 insulation is deteriorated.

NIOSH

RECORDKEEPING REQUIREMENTS

Recordkeeping requirements under OSHA are intended to compile factual information about accidents that have happened. These records provide employers with a measure for evaluating the success of their health and safety activities and of identifying high risk areas of the business to which attention should be directed. Federal regulations REQUIRE that employers with 11 or more employees at any time during the previous calendar year 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. Examples are asbestos, ionizing radiation, etc.

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

NIOSH

RECORDKEEPING REQUIREMENTS (cont.)

job safety and health protection

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

DEPARTMENT OF LABOR · UNITED STATES OF AMERICA

Washington, D.C.
1974
OSHA 2203

Peter J. Brennan
Secretary of Labor

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

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

NIOSH

CHECKLISTS

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

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

Using this checklist, the manager, supervisor, or employee representative should make 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"*.

CHECKLISTS (cont.)

WALKING AND WORKING SURFACES

AISLES AND FLOORS (29 CFR 1910.22)

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

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

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

STAIRS (29 CFR 1910.24)

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

NIOSH

CHECKLISTS (cont.)

	Yes	No
Do stairs have at least a seven foot overhead clearance?	☐	☐
Do stairs angle no more than 50° and no less than 30°?	☐	☐
LADDERS (29 CFR 1910.25, .26, .27)		
Have defective ladders (e.g., broken rungs or split side rails) been tagged as "DANGEROUS, DO NOT USE" and removed from service for repair or destruction?	☐	☐
Is it prohibited to use the top of an ordinary step ladder as a step?	☐	☐
Do fixed ladders have at least 3½ feet of extension at the top of the landing?	☐	☐
Is the distance between the centerline of rungs on a fixed ladder and the nearest permanent object in back of the ladder at least seven inches or more?	☐	☐
Do all fixed ladders have a preferred pitch of 75°-90°?	☐	☐
EGRESS (29 CFR 1910.36-.38)		
Are all exits marked with an exit sign and illuminated by a reliable light source?	☐	☐
Is the lettering at least six inches high with the principle letter strokes at least ¾ of an inch wide?	☐	☐
Is the direction to exits, when not immediately apparent, marked with visible signs?	☐	☐

CHECKLISTS (cont.)

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

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL (29 CFR 1910.93, .94, .95)

Is management aware of the hazards caused by various chemicals used in the establishment?	☐	☐
Is employee exposure to these chemicals kept within the acceptable levels?	☐	☐
Are all containers, such as vats and storage tanks, labeled as to their contents?	☐	☐

OCCUPATIONAL NOISE EXPOSURE (29 CFR 1910.95)

If a noise problem is suspected, have noise levels been accurately measured?	☐	☐

NIOSH

CHECKLISTS (cont.)

	Yes	No
If a noise problem exists, have plans to reduce noise levels by engineering methods been formulated (e.g., enclosure, maintenance, or different methods of processing)?	☐	☐
If engineering controls cannot reduce the noise to safe levels; have administrative controls, such as limiting worker-exposure in a given area, been started?	☐	☐
If necessary, are affected employees given annual audiometric tests?	☐	☐
Do all employees in high-noise areas wear hearing protection?	☐	☐
Are annual noise surveys made to re-evaluate problem areas?	☐	☐

HAZARDOUS MATERIALS

FLAMMABLE AND COMBUSTIBLE LIQUIDS (29 CFR 1910.106)

Are all connections on drums and combustible liquid piping vapor and liquid tight?	☐	☐
Are flammable liquids kept in closed containers when not in use (e.g., parts cleaning tanks or pans)?	☐	☐
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?	☐	☐

CHECKLISTS (cont.)

	Yes	No
Are bulk drums of flammable liquids grounded and bonded to containers during dispensing?	☐	☐
Are gasoline and other flammable liquids stored in approved containers?	☐	☐
Are LP-gas storage tanks guarded to prevent damage from vehicles?	☐	☐
Are "NO SMOKING" signs posted on LP-gas tanks?	☐	☐
Are storage cabinets for flammable and combustible liquids labeled "FLAMMABLE—KEEP FIRE AWAY"?	☐	☐
Is there never more than one day's supply of flammables outside of approved storage cabinets or rooms?	☐	☐
Are all paints, lacquers, or thinners kept for more than 30 days stored in approved metal or wooden cabinets or in storage rooms?	☐	☐
Do metal cabinets meet the following requirements?		
18 gauge sheet iron (minimum).	☐	☐
Double wall with 1½ inches air space.	☐	☐
Three point lock on the door.	☐	☐
Door sill is at least two inches above bottom of cabinet?	☐	☐

CHECKLISTS (cont.)

Do wood cabinets meet the following requirements?

One inch plywood that will not break down or delaminate under fire conditions. ☐ ☐

All joints are rabbetted. ☐ ☐

If more than one door is used, is there at least a one inch rabbetted overlap? ☐ ☐

FLAMMABLE AND COMBUSTIBLE LIQUIDS (29 CFR 1910.106)

UNDERGROUND TANKS

Is the vent pipe a minimum I.D. of 1¼ inches? ☐ ☐

Does the vent pipe extend at least 12 feet above grade? ☐ ☐

Is the vent pipe located so vapors do not discharge inside buildings or become trapped under eaves, etc.? ☐ ☐

LOADING RACK

Are tank loading facilities separated by a minimum of 25 feet from above ground tanks? ☐ ☐

Are tank truck loading facilities separated by a minimum of 25 feet from warehouse and other buildings? ☐ ☐

Are tank truck loading facilities separated by a minimum of 25 feet from nearest adjoining property which may be built upon? ☐ ☐

Are bonding cables at top loading facilities in

CHECKLISTS (cont.)

	Yes	No
good condition and operable where Class I liquids are handled?	☐	☐
Does all electrical equipment in the area conform to the provisions of the National Electrical Code?	☐	☐
PERSONAL PROTECTIVE EQUIPMENT (29 CFR 1910.132-137)		
Is personal protective equipment provided, used, and maintained wherever it is necessary?	☐	☐
Is employee-owned personal protective equipment, such as gloves and protective shoes, adequate and properly maintained?	☐	☐
Is eye protection available where debris or flying objects could be a hazard?	☐	☐
Are ear plugs or muffs provided and worn during noisy conditions?	☐	☐
Is slip-resistant footwear worn?	☐	☐
RESPIRATORY PROTECTION DEVICES (29 CFR 1910.134)		
Are respirators provided when necessary?	☐	☐
Are there written standard operating procedures for the selection and use of respirators?	☐	☐
Is the user instructed and trained in the proper use of respirators?	☐	☐

NIOSH

CHECKLISTS (cont.)

	Yes	No
Where practicable, are respirators assigned for use by employees individually?	☐	☐
Are respirators cleaned and disinfected after use?	☐	☐
Are respirators stored in a convenient, clean, and sanitary location?	☐	☐
Are routinely-used respirators inspected during cleaning?	☐	☐
Is the proper respirator in use for the hazards present? (For example, dust masks do not protect against solvent vapors.)	☐	☐

GENERAL ENVIRONMENTAL CONTROLS

SANITATION (29 CFR 1910.141-.149)

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

CHECKLISTS (cont.)

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

MEDICAL AND FIRST AID (29 CFR 1910.151)

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

CHECKLISTS (cont.)

FIRE PROTECTION (29 CFR 1910.157, .159, .160)	Yes	No
Are extinguishers selected for the types of combustibles and flammables in the areas where they are to be used? Class A. Ordinary combustible material fires Class B. Flammable-liquid, or grease fires Class C. Energized-electrical-equipment fires		
Are extinguishers fully charged and in their designated places?	☐	☐
Are extinguishers located along normal paths of travel?	☐	☐
Are extinguisher locations free from obstruction or blockage?	☐	☐
Are extinguishers not mounted too high? If not exceeding 40 pounds, the top must not be higher than five feet above floor. If greater than 40 pounds, the top must not be higher than 3½ feet above floor.	☐	☐
Have all extinguishers been serviced, maintained, and tagged at intervals not to exceed one year?	☐	☐
Are all extinguishers checked (by management or designated employee) monthly to see if they are in place or if they have been discharged, etc.?	☐	☐

CHECKLISTS (cont.)

	Yes	No
Have all extinguishers been hydrostatically tested according to schedules set for the type of extinguisher?	☐	☐

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

Is there safe clearance for equipment through aisles and doors?	☐	☐
Is stored material stable and secure?	☐	☐
Are storage areas free from tripping hazards?	☐	☐
Are only trained operators allowed to operate powered lift trucks?	☐	☐
Are appropriate overhead guards installed on powered lift trucks?	☐	☐
Is battery charging on electric units performed only in designated areas?	☐	☐
Are "NO SMOKING" signs posted near electric battery charging units?	☐	☐
On units using internal combustion engines, do the exhaust gases in the room not exceed allowable limits for carbon monoxide?	☐	☐
Are dock boards (bridge planks) used when loading or unloading from dock to truck?	☐	☐
Are containers of combustibles or flammables when stacked one upon the other always		

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CHECKLISTS (cont.)

	Yes	No
separated by dunnage sufficient to provide stability?	☐	☐
Are racks and platforms always loaded within the limits of their capacity?	☐	☐
Is all storage secured against sliding or collapse?	☐	☐
Are all vehicles shut off prior to loading?	☐	☐
Have all aisles been designated and kept clear to allow unhindered passage?	☐	☐
If motorized equipment such as forklift trucks are used, are aisles permanently marked—providing sufficient clearance for passage of equipment?	☐	☐
Are specifications posted for maximum loads approved for any floor, roof of a building, or other structure?	☐	☐
Is there no combustible material piled next to lights or piled so that it would cause interference with the sprinkler system?	☐	☐

MACHINE AND MACHINE GUARDING (29 CFR 1910.212)

Are belts, pulleys, and rotating shafts (air compressor, drill presses, etc.) properly guarded?	☐	☐
Are chains, sprockets, and gears properly guarded?	☐	☐
Are all in-going nip points properly guarded?	☐	☐

CHECKLISTS (cont.)

	Yes	No
Are rotating shafts that are not smooth properly guarded?	☐	☐
Are sprockets and V-belt drives within reach of platforms and passageways or less than seven feet from the floor completely enclosed?	☐	☐
Are fans less than seven feet above floor guarded, having openings ½ inch or less?	☐	☐
ABRASIVE WHEEL MACHINERY (Grinders) (29 CFR 1910.215)		
Is the work rest used and kept adjusted to within ⅛ inch of wheel?	☐	☐
Is the adjustable tongue on top side of grinder used and kept adjusted to within ¼ inch of wheel?	☐	☐
Do side guards cover the spindle, nut, and flange and 75% of the wheel diameter?	☐	☐
Are bench and pedestal grinders permanently mounted?	☐	☐
Are goggles or face shields always worn when grinding?	☐	☐
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?	☐	☐

CHECKLISTS (cont.)

	Yes	No
Have worn or bent wrenches been replaced?	☐	☐
Are portable abrasive wheels appropriately guarded?	☐	☐
Have employees been made aware of the hazards caused by faulty or improperly used hand tools?	☐	☐
Has compressed air used for cleaning been reduced to 30 psi when dead ended?	☐	☐
Have employees been instructed that the use of compressed air to blow debris from clothing or body is prohibited because it can enter the body and cause serious harm?	☐	☐
Have deteriorated air hoses been replaced?	☐	☐

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?	☐	☐
Are cylinders secured and stored where they cannot be knocked over?	☐	☐
Are cylinder protective caps in place except when the cylinder is in use?	☐	☐
Are compressed gas cylinders kept away from sources of heat, elevators, stairs, or gangways?	☐	☐

CHECKLISTS (cont.)

	Yes	No
Are only instructed employees, who are judged competent by the employer, allowed to use oxygen or fuel gas equipment?	☐	☐
Do all cylinders (except those with fixed hand wheels) have non-adjustable wrenches, keys, or handles in place on valve stems while cylinders are in use?	☐	☐
Is welding always conducted at a safe distance from flammable liquids?	☐	☐
Are all compressed gas cylinders legibly marked for identifying the content?	☐	☐
Are the valves shut off when the cylinder is not in use?	☐	☐
Are flash shields provided to protect nearby workers from the welding flash?	☐	☐
Are electrode holders with the electrode removed away from conducting objects when not in use?	☐	☐

NATIONAL ELECTRICAL CODE

ELECTRICAL WIRING

Have exposed wires, frayed cords, and deteriorated insulation been repaired or replaced?	☐	☐
Are junction boxes, outlets, switches, and fittings covered?	☐	☐
Is all metal fixed electrical equipment grounded?	☐	☐

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CHECKLISTS (cont.)

	Yes	No
Does all equipment connected by cord and plug have grounded connections?	☐	☐
Are electrical appliances such as vacuums, blowers, vending machines, etc. grounded?	☐	☐
Are all portable electrical hand tools grounded? (Double insulated tools are acceptable without grounding.)	☐	☐
Are breaker switches identified as to their use?	☐	☐
Do flexible cords and cables not run through holes in wall or ceiling or through doorways or windows?	☐	☐
Are flexible cords and cables free from splices or taps?	☐	☐
Are flexible cords and cables fastened so that there is no direct pull on joints or terminal screws?	☐	☐
Are flexible cords and cables never substituted for fixed wiring?	☐	☐
Are flexible cords and cables not attached to building surfaces?	☐	☐
Is electrical equipment accessible?	☐	☐
Are all conduit connections intact?	☐	☐
Do all extension cords being used have a ground wire?	☐	☐
Are all extension cords in use of appropriate wiring to carry the current being drawn?	☐	☐

CHECKLISTS (cont.)

	Yes	No
Are multiple plug adapters not used?	☐	☐

RECORDKEEPING (29 CFR 1904.2-.8)

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

NIOSH

INFORMATION SOURCES

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

☐ A12.1	Floor and Wall Openings
☐ A13.1	Identification of Piping Systems
☐ A54.1	Carbon Dioxide Extinguishing Systems
☐ B31.3	Petroleum Refinery Piping
☐ B31.8	Gas Transmission and Distribution Piping System
☐ B56.1	Powered Industrial Trucks
☐ C1	National Electrical Code (NEC)
☐ Z9.1	Ventilation and Operation of Open-Surface Tanks
☐ Z49.1	Welding and Cutting
☐ Z106.1	Liquified Petroleum Gases
☐ Z112.1	Portable Fire Extinguishers

AMERICAN PETROLEUM INSTITUTE
1801 K Street, N.W. Washington, D.C. 20006 (202) 833-5600

NATIONAL OIL JOBBERS COUNCIL
1701 K Street, N.W. Washington, D.C.

PETROLEUM MARKETING EDUCATION FOUNDATION
P.O. Box 19, Kennett, Missouri 63857

NATIONAL FIRE PROTECTION ASSOCIATION
470 Atlantic Avenue, Boston, Massachusetts 02110

NATIONAL SAFETY COUNCIL
425 North Michigan Avenue, Chicago, Illinois 60611

NIOSH AND OSHA REGIONAL DIRECTORS

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

KIND OF FIRE

DECIDE THE CLASS OF FIRE YOU ARE FIGHTING. . .

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

APPROVED TYPE OF EXTINGUISHER

MATCH UP PROPER EXTINGUISHER WITH CLASS OF FIRE SHOWN AT LEFT

FOAM	CARBON DIOXIDE	SODA ACID	PUMP TANK	GAS CARTRIDGE	MULTI-PURPOSE DRY CHEMICAL	ORDINARY DRY CHEMICAL
Solution of Aluminum Sulphate and Bicarbonate of Soda	Carbon Dioxide Gas Under Pressure	Bicarbonate of Soda Solution and Sulphuric Acid	Plain Water	Water Expelled by Carbon Dioxide Gas		
✓	✗	✓	✓	✓	✓	✗
✓	✓	✗	✗	✗	✓	✓
✗	✓	✗	✗	✗	✓	✓

CLASS A FIRES

USE THESE EXTINGUISHERS

ORDINARY COMBUSTIBLES
- WOOD
- PAPER
- CLOTH

ETC.

CLASS B FIRES

USE THESE EXTINGUISHERS

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

CLASS C FIRES

USE THESE EXTINGUISHERS

ELECTRICAL EQUIPMENT
- MOTORS
- SWITCHES

ETC.

HOW TO OPERATE

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

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

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

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

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

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

TABLE I

NIOSH AND OSHA REGIONAL OFFICES

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

NIOSH REGIONAL OFFICES

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

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

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

DHEW, Region IV
50 Seventh Street, N.E.
Atlanta, Georgia 30323
Tel.: 404/526-5474

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

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

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

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

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

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

HOW TO LIFT SAFELY

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

The factors that contribute to safe lifting are...

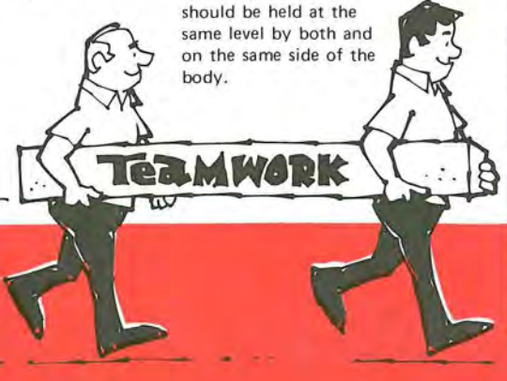
DETERMINE IF OBJECTS CAN BE LIFTED AND CARRIED, SAFELY.

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

When lifting and carrying with another person—teamwork is important.

The load should be equally distributed. Movements must be coordinated so you both start and finish the lift action at the same time and perform turning movements together.

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



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

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

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

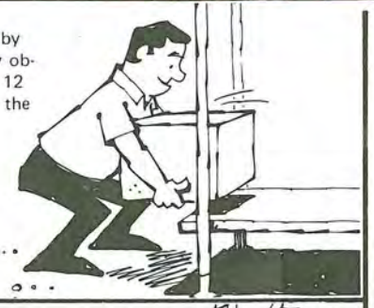
4. Lift the load straight up—smoothly and evenly. Pushing with your legs, keep load close to your body.

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

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

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

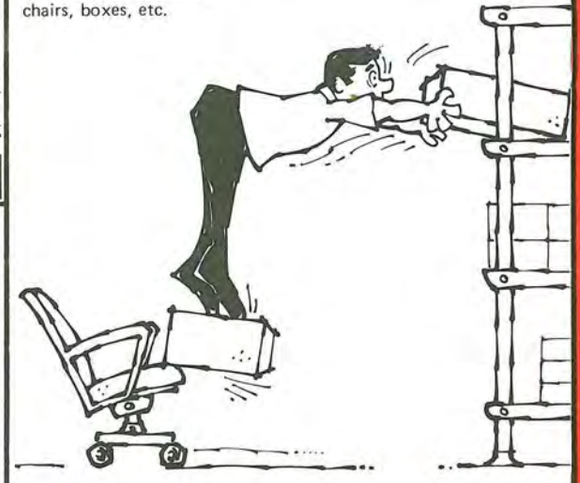
Avoid strain by storing heavy objects at least 12 inches above the floor.



Avoid awkward positions or twisting movements while lifting.

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

Use a ladder instead of chairs, boxes, etc.



NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

OSHA REGIONAL OFFICES

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

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

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

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

Region V
U.S. Department of Labor
Occupational Safety and Health Administration
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: 214/749-2477/8/9 or 2567

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

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

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

Region X
U.S. Department of Labor
Occupational Safety and Health Administration
1808 Smith Tower Building, 506 Second Avenue
Seattle, Washington 98104 . . . . . Telephone: 206/442-5930

☆ U.S. GOVERNMENT PRINTING OFFICE: 1976— 657-692/1507

EMERGENCY INFORMATION

FIRE

Telephone Fire Department _____

Nearest Alarm Box at _____

CRIME

Telephone Police _____

INJURY/ILLNESSES

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

Doctor _____

Office _____ Tel. _____

Residence _____ Tel. _____

_____

_____

Hospital _____

Address _____ Tel. _____

Ambulance _____

Address _____ Tel. _____

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

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

1. Name _____ Office Tel. _____

   Address _____ Res. Tel. _____

or

2. Name _____ Office Tel. _____

   Address _____ Res. Tel. _____

DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
Post Office Building
Cincinnati, Ohio 45202

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