

CHAPTER 6

SAFETY

	Paragraph
Policy	6-101
Accident costs	6-102
Training personnel to avoid accidents	6-103
Accident prevention program	6-104
Safety equipment and clothing	6-105
Fire protection	6-106
Fire suppression equipment (portable fire extinguishers)	6-107
Housekeeping as related to general storage	6-108
Rules for "safe storage"	6-109
Size of storage blocks, clearances, heights, and limitations	6-110
Signs and color code markings, in relation to safety in storage	6-111
Safety practices for powered materials handling equipment	6-112
Safety practices for nonpowered materials handling equipment	6-113
Manual handling	6-114
Safety in loading and unloading railroad cars/trucks and trailers	6-115
Buildings and physical equipment	6-116
Flammable materials	6-117
Poisonous, toxic and radioactive materials	6-118
Corrosive materials	6-119
Certain other hazardous commodities	6-120
Safety in acid storage	6-121
Petroleum products—safety precautions	6-122
Safety precautions for solid fuels in storage	6-123
Lumber yard—fire precautions	6-124
Strategic and critical material	6-125

6-101. Policy

a. Provisions of this chapter apply to general industrial and operational safety for storage and **handling** of military supplies.

(1) Occupational safety and health requirements set forth in this regulation are based in part on the DOD occupational safety and health standards established by DOD instruction 6055.1.

(2) Selected Department of Labor (**OSHA**) standards are cited in this regulation as a ready reference.

(3) Specific safety requirements for storage **and** handling of ammunition and explosives are established by DOD standards and military service directives.

(4) In the event of a conflict between the requirements set forth in this regulation and a specific OSHA standard, the issue will be referred to component headquarters for resolution.

b. A safety program will be established for storage operations at major supply installations and separate storage activities in the continental United States and overseas. Safety will be included in and made an integral part of storage operations. It is the responsibility of each official in charge of storage at these installations to institute a suitable program, utilizing the technical services of the installation safety director or safety engineer in all matters dealing with accident prevention. Installations and separate storage activities commanders will take steps to assure that the accident prevention program in storage operations is effectively enforced at all levels of supervision under their jurisdiction.

6-102. Accident Costs

a. Manhours. Accidents involving personnel can have an adverse effect on productive manhours and

planned production schedules. Productive man-hours lost through accidents cannot normally be recouped immediately since replacement personnel, or required skills, are not readily available.

b. Damaged or destroyed material. When material is damaged or destroyed by accident, costs are incurred to accomplish necessary repairs and/or replacement of material. Other consequences include production delays and a possible shortage of critical material.

6-103. Training Personnel to Avoid Accidents'

a. Safety knowledge "and training. Operating personnel must be given proper instruction and training concerning potential dangers associated with their daily tasks. An awareness of apparent or potential dangers and training to avoid such hazards will assist in reducing accidents while performing normal tasks.

b. Knowledge of hazardous material. Certain items, such as explosives, flammable material, chemicals, acids, etc., obviously require more care and attention than other items. The characteristics of the material being stored or handled dictate the care and attention necessary to avoid risks and potential hazards. Personnel handling hazardous material must possess a knowledge of all potential hazards concerning the commodities under their control.

c. Knowledge of equipment.

(1) *Design.* Equipment is generally designed to perform a specific function. For example, MHE will safely handle a specified maximum load, travel at a maximum speed, ascend or descend a maximum grade, and operate safely under specified conditions. A potential hazard can be created when equipment is selected for use in operations beyond the rated capacity or for other than the purpose designated.

(2) *Use.* Equipment must be used only for the purpose for which designed. For example, use of electric powered spark enclosed equipment is required when handling flammable gases. All equipment must be checked to determine suitability for the task and if any doubt exists as to suitability, qualified personnel must be consulted.

(3) *Special attachments.* In areas where flammable materials are stored and handled, the use of spark enclosed equipment and special attachments thereto will reduce operating hazards. When front end attachments are used which are not factory

installed, the user shall request that the truck be marked to identify the attachment and show the approximate weight of the truck and attachment combination at maximum load elevation with load laterally centered.

(4) *Maintenance.* Equipment which is not in proper operating condition constitutes a hazard. Operator will not operate equipment that appears to be mechanically unsafe. They will not attempt to repair such equipment but will report unsafe equipment to their supervisor for appropriate corrective action or replacement.

d. Methods. Personnel will be trained in the proper methods of operating equipment. Training information or programs may be found in chapter IV, section 5 of this regulation or in the National Safety Council Drivers Training Course.

e. Layout. Familiarity of the storage layout or area is an important factor for the prevention of accidents. The following conditions must be considered:

(1) *Distance.* The greater the distance traveled, the greater the potential for accidents.

(2) *Terrain.* The rougher the terrain the greater potential for accidents.

(3) *Elevation changes.* Changes in elevation can constitute a hazard. Elevation changes can involve extra handling and increase the potential for accidents.

(4) *Aisles.* Narrow aisles, turns and jogs in aisles, bumps or protruding objects constitute hazards.

6-104. Accident Prevention Program

a. Analysis of operation. Each physical operation will be analyzed by supervisory or safety personnel to predetermine inherent and manmade hazards. Operating procedures will then be developed which either remove or control the hazards identified. Methods of control include substitution with safer equipment or procedures, isolation of hazardous operations, mechanical guarding, redesign of facility and/or equipment layout, and others. Installation safety specialists can be of great assistance in developing hazard controls to satisfy specific safety requirements.

b. Training of personnel. At each facility, safety training programs will be developed for supervisors and employees. Formal safety training, fire prevention training, or other required instruction will be performed by supervisors with assistance from

installation safety, fire prevention, and health activities.

c. *Reports.* All accidents will be investigated and reported in accordance with existing procedures of the appropriate **military** department.

6-105. Safety Equipment and **Clothing**

a. *Use.* When a hazard still exists after all **practical** control methods have been taken, workers **must be** given further protection through protective equipment or clothing. The type of equipment **and/** or clothing required will depend upon the nature of the hazards involved. This equipment will not be used as a substitute for the elimination or control of unsafe acts and conditions, but rather as a supplemental safety measure.

b. *Types of protective clothing and equipment.*

(1) *Synthetic rubber gloves.* Synthetic rubber gloves **will** be worn for protection when handling ordinary commercial concentrations of harmful chemicals, petroleum products, or chlorinated solvents,

(2) *Natural rubber gloves.* Natural rubber gloves will be worn for protection when handling high concentrations of acids and alkalis, organic solvents, and other chemicals which are highly toxic or corrosive or which probably will injure the skin or induce dermatitis. Natural rubber gloves will not be used for protection against petroleum products and chlorinated solvents.

(3) *General **purpose** workmen's gloves.* When performing general labor work and when sharp or rough material is being handled general purpose workmen's gloves will be worn for protection of hands from cuts and abrasions. The glove palm, thumb, and index finger are covered with leather. When glass is handled, gloves with suction cups or leather palms will be worn. When gloves with leather parts are used, care must be taken that the leather parts do not become greasy.

(4) *Hoods, aprons, sleeves and suits.* Hoods, aprons, sleeves, or suits made from natural or synthetic rubber or acid resisting rubberized cloth will be worn for protection when filling open vessels with acid or when handling individual containers of acid to protect personnel from possible leakage or breakage of containers.

(5) *Rubber framed goggles (29 CFR 1910.189).* Rubber-framed goggles will be worn for protection of the eyes against smoke, gas, fine dust, mists,

and sprays or splashes of liquid or other substances, including acids and alkali solutions.

(6) *Spectacle goggles (29 CFR 1910.133).* Spectacle goggles with side shields will be worn for eye protection against flying particles of dust, chips, and machine cuttings. Spectacle **goggles** without side shields will be worn for other operations requiring eye protection.

(7) *Protective hat (helmet) (29 CFR 1910.135) (ANSI 289.1).*

(a) A protective hat will be worn for head protection against falling or flying objects or from bumping head when working in cramped places. A protective hat will always be worn when in yards or areas when material is being lifted or hoisted or where ends of slings or other gear could swing against the head.

(b) Bump caps are of a thin shelled light weight plastic construction and do not meet the specifications of ANSI Z89.1 for **impact** flying particle and electric shock protection. Bump caps are not to be substituted for protective hard hat and their use should be limited to exposures where bumping of the head is the only consideration.

(8) *Protective headgear (cap or beret type).* Protective headgear will be worn to confine long hair and prevent entanglement with moving or rotating machinery, open flames, or dust accumulation.

(9) *Welders gloves, goggles, mitts, helmet, and jacket (29 CFR 1910.252(e)).* Welders gloves, goggles, mitts, helmets and jackets **will** be worn for protection of hands, face, eyes, and body against sparks, chips, and flame resulting from welding or cutting processes.

(10) *Safety toe shoes and foot or toe guards.* Authorized safety toe footwear or approved foot **and/or** toe guards will be worn while working in areas, or while performing operations designated by the appropriate authority as hazardous to feet or toes of the workers. Safety toe shoes will meet standards as set forth in **29** CFR 1910.136 and ANSI **Z41.1** for occupational footwear. The activity will provide advice and instructions on procurement of safety toe footwear and toe or foot guards.

(11) *Sparkproof **safety** shoes.* The friction and shock of shoes on explosive materials and sparks from metal parts in shoes are potential hazards with **all** explosive materials. Conductive sparkproof shoes shall be worn in the vicinity of exposed explosives which are susceptible to static spark of the energy that can be discharged from a person. The construction

tion of nonspark-producing or explosives operation shoes should be in accordance with the latest United States of America Safety Standard. Shoes with soles and heels of leather, rubber, or synthetic compositions (**neolite**, Neoprene and similar compositions) may be used provided the soles and heels contain no exposed nails or holes. The shoes shall have a fully enclosed safety toe cap. Periodic inspections shall be made to detect and eliminate any ; **shoes** with exposed metal. The soles and heels of **shoes** must be cleaned free from sand and dirt before entering a building containing explosives. Conductive shoes meeting the requirements for explosives operations (**nonspark-producing** shoes) may be substituted for them if desired,

(12) *Respiratory protection (29 CFR 1910.134)*,

An effective respiratory protection program should include the following.

- (a) Written standard operating procedures.
- (b) Instruction and training in the proper selection and use of respirators.
- (c) Assignment of respirators to individual users, when practicable.
- (d) Cleaning and disinfection procedures for respirators.
- (e) Proper techniques for storage of respirators.
- (f) Criteria for inspection of respirators.
- (g) Surveillance of work conditions to determine respirator needs.
- (h) Determination of fitness of workers to wear respirators.
- (i) Periodic program evaluation.

(13) *General purpose gas mask*. The general purpose gas mask is used for respiratory protection in an area in which there is a minimum concentration of toxic gases or vapors. This mask cannot be used safely in an area in which the vapors are concentrated to the extent that the flame of a safety lamp would be extinguished. This mask affords protection, for a limited time, against concentrations up to 20,000 parts per million parts of air. Protection is afforded against organic vapors and gases, carbon monoxide, toxic dust, fumes, mists, fogs, and smoke. However, the mask is not used for **day**-after-day protection in routine work as are various other types of respirators.

(14) *Special purpose gas mask*. The special purpose gas mask is used for respiratory protection in areas in which there is a minimum or moderately high concentration of toxic gases or vapors. This

mask cannot be used safely in an area in which the vapors are concentrated to the **extent that the flame** of a safety lamp would be extinguished. Specific types of canister refills used in the mask afford protection against specific types of contaminants. It is extremely important to know or determine what classes of contaminants are likely to be present, and equally important to know what contaminants a given canister will protect against. The mask is **available** with a wide selection of canisters, providing respiratory protection against all the poisonous gases except carbon monoxide and other gas mixtures containing carbon monoxide, such as coal gas. Generally, the mask is used when entering confined spaces containing dangerous atmospheres, to rescue others who have been overcome, and for doing necessary work of an emergency nature. The mask is not used for day-after-day protection in routine work as are various types of respirators. The difference between the use of the special purpose mask and the general purpose mask is that the special purpose mask is used to protect against specific classes of gases and vapors and the general purpose mask is used to protect against all classes of toxic gases, including carbon monoxide. The exact **difference** is in the canisters used, and that the general purpose mask has a timing device while a timing device is not provided in the special purpose mask. See references to documents of appropriate military department in appendix A, for sources of organic vapors and acid gases, and for the type of canister to use in relation to type of contamination for which protection is required. All tank cleaning operations will be performed in strict conformance with the provisions of the publications of the appropriate **military** department.

Note. Warning Never use a gas mask without carefully assessing exposure conditions. Use suitable instruments (para (16) below) to determine concentration of oxygen and air contaminants, if possible. If in doubt about exposure conditions use self-contained breathing apparatus only. Always use strictly in accordance with canister labels, gas mask instructions, and limitations. Do not use gas masks for infighting.

(15) *Self-contained breathing apparatus*. The purpose of this apparatus is for protection in areas where general purpose gas mask or special purpose gas mask is not applicable. Training of personnel in the use of the breathing apparatus and inspection for operational capability will be the responsibility

of the installation fire department or appropriate personnel of the respective service.

(16) *Combustible* gas and oxygen indicator. The purpose of this dual purpose instrument is to monitor areas for buildup of potentially hazardous **combustible** gases, and/or oxygen deficiency. **Typically** such areas include vaults, tunnels, sewers, ship holds, and areas where combustible fluids are used or stored.

(17) *Portable combustible gas indicating detector*—s. **Portable combustible gas** indicating detectors are available for use as follows:

(a). For **detection of** miscellaneous flammable gases (including hydrogen) and vapors.

(b) For indication of the concentration of hydrogen in mixtures with air or oxygen.

(c) For detecting combustible gases or vapors associated with fuel oils, gasoline, and paints.

(d) For detecting concentrations of one or more specific combustible gases in mixture with air or oxygen.

(18) *Safety hand tools*.

(a) **Safety hand tools** are constructed of wood or other nonsparking or spark resistant materials such as bronze, lead, beryllium alloys, and "K" **Monel** metal which, under normal conditions of use, **will** not produce sparks. Properly maintained, non-ferrous hand tools shall be used for work in locations which contain exposed explosives or hazardous concentrations of flammable dusts, gases or vapors. Hand tools or other implements used in the vicinity of hazardous materials must be handled carefully and kept clean. **All** tools should be checked out before beginning work and checked in at its completion.

(b) **Metal hand** tools determined to be spark resistant by tests conducted in accordance with paragraph 4.6.3, **MIL-W-19928A**, dated 15 February 1967, may also be used as in (a) above.

(c) If the use of ferrous metal hand tools, not in accordance with (b) above, is required because of strength characteristics, the immediate area should be free **from** exposed explosives and other highly combustible materials except in specific operations approved by the **service/agency** concerned.

(19) *Safety treads*. Safety treads should be installed on ladders, stairs, and floor surfaces to prevent slipping. Several types of safety treads are available.

(20) *Knee pads*. Knee pads will provide for pro-

tection of knees of carpenters, riggers, or mechanics who must kneel while working.

(21) *Carboy titter*. Carboy **tilters will** be used for safe removal of dangerous liquids, such as acids, from **carboys**.

(22) *Special bung fittings and automatic faucets*. Special bung fittings and automatic faucets will be used on drums for dispensing and storing of dangerous liquids. (Ref NFPA Code 30)

(23) *Special gas fill caps and metal sediment bowls*. Special gas fill caps and metal sediment bowls **will** be used on powered materials handling equipment for safety in replenishment of fuel.

6-106. Fire Protection (29 CFR 1910.156)

a. *Classification of fires*.

(1) **Class A fires** are fires in ordinary combustible materials, such as wood, cloth, paper, and rubber.

(2) **Class B fires** are **fires** in flammable liquids, gases, and greases.

(3) **Class C fires** are fires which involve energized electrical equipment where the electrical **non-conductivity** of the extinguishing media is of importance. (When electrical equipment is de-energized, extinguishers for Class A or B fires may be used safely.)

(4) **Class D fires** are **fires** in combustible metals, such as magnesium, titanium, zirconium, sodium, and potassium.

b. *Classification of portable extinguishers*.

(1) **Portable fire extinguishers** are classified for use on certain classes of fires and rated for relative extinguishing effectiveness at a temperature of plus 70° F by nationally recognized testing laboratories. This is based upon the preceding classification of fires and the fire extinguishment potentials as determined by fire tests.

(2) The classification and rating system described in this section is that used by Underwriters' Laboratories, Inc. and Underwriters Laboratories of Canada and is based on extinguishing preplanned fires of determined size and description as follows:

(a) **Class A rating—Wood** and excelsior **fires** excluding deepseated conditions.

(b) **Class B rating—Two-inch** depth gasoline fires in square pans.

(c) **Class C rating—No fire test**. Agent must be a nonconductor of electricity.

(d) **Class D rating—Special** tests on specific combustible metal fires.

c. Classification of hazards.

(1) A **light hazard** is a situation where the amount of combustibles or flammable liquids present is such that fires of small size may be expected. These may **include** offices, schoolrooms, churches, assembly halls, telephone exchanges, etc.

(2) An **ordinary hazard** is a situation where the amount of combustibles or flammable liquids present is such that fires of moderate size may be expected. These may include mercantile storage and **display, auto showrooms, parking garages, light manufacturing**, warehouses not classified as extra hazard, school shop areas, etc.

(3) An **extra hazard** is a situation where the amount of combustibles or flammable liquids present is such that fires of severe magnitude may be expected. These may include woodworking, **auto repair, aircraft servicing, warehouses with high-piled (14 feet or higher) combustibles, and processes such as flammable liquid handling, painting, dipping, etc.**

d. Sprinkler system. A **sprinkler system**, for fire protection purposes, is an integrated system of underground and overhead piping designed in accordance with fire protection engineering standards. The system includes a suitable water supply, such as a gravity tank, fire pump, reservoir, or pressure tank **and/or** connection by underground piping to a city main. The portion of the sprinkler system above ground is a network of specially sized or hydraulically designed piping installed in a building, structure or area, generally overhead, and to which sprinklers are connected in a systematic pattern. The system includes a controlling valve and a device for actuating an alarm when the system is in operation. The system is usually activated by heat from a **fire** and discharges water over the fire area.

Note. The design and installation of water supply facilities such as gravity tanks, fire pumps, **reservoirs**, or pressure tanks, and underground piping are covered by NFPA Standards No. 22-1970, Water Tanks For Private Fire Protection; No. 20-1970, Installation of Centrifugal Fire Pumps; and No. 24-1970, Outside Protection.

e. Sprinkler alarms. A **sprinkler alarm unit** is an assembly of apparatus approved for the service and so constructed and installed that any **flow** of water from a sprinkler system equal to or greater than that from a single automatic sprinkler will result in an audible alarm signal on the premises.

f. Class of service—standpipe systems.

(1) Standpipe systems are grouped into three

general classes of service for the intended uses in the extinguishment of fire.

(a) **Class I—For** use by fire departments and those trained in handling heavy **fire streams (2½-inch hose)**. The system is capable of furnishing the effective fire streams required during the more advanced stages of fire on the inside of buildings or for exposure fire.

(b) **Class II—For** use primarily by the building occupants until the arrival of the fire department (small hose). The system affords a ready means for the control of incipient **fires** by the occupants of buildings during “working hours and by watchmen and those present during the night time and holidays.

(c) **Class III—For use** by either fire departments and those trained in handling heavy hose streams or by the building occupants. The system is capable of furnishing the effective fire streams required during the more advanced stages of fire on the inside of buildings as well as providing a ready means for the control of **fires** by the occupants of the building.

(2) Standpipe systems are usually of the following types:

(a) A wet standpipe system having a supply valve open and water pressure maintained at **all** times.

(b) A standpipe system so arranged through the use of approved devices as to admit water to the system automatically by opening a hose valve.

(c) A standpipe system arranged to admit water to the system through manual operation of approved remote control devices located **at** each hose station.

(d) Dry standpipe having no permanent water supply.

(Note. See 29 CFR 1910.158 for specific design and requirements for standpipe and hose systems.)

g. Types of storage (in relation to fire protection).

(1) **Type I storage.** Type I storage is that in which combustible commodities or noncombustible **commodities** involving combustible packaging or storage aids are stored over 15 feet but not more than 21-feet high in solid piles or over 12 feet but not more than 21-feet high in piles that contain horizontal channels. Minor quantities of commodities of hazard greater than ordinary combustibles may be **included** without affecting this general classification.

(2) *Type II storage.* Type II storage is that in which combustible commodities or noncombustible commodities involving combustible packaging or storage aids are stored not over 15 feet-high in solid piles or not over 12 feet high in piles that contain horizontal channels. Minor quantities of commodities of hazard greater than ordinary combustibles may be included without affecting this general classification.

(3) *Type II storage.* Type III storage is that in which the stored commodities, packaging, and **storage aids are** noncombustible or contain only a small concentration of combustibles which are incapable of producing a fire that would cause appreciable damage to the commodities stored or to noncombustible wall, floor, or roof construction. Ordinary combustible commodities in completely sealed noncombustible containers may qualify in this classification. General commodity storage that is subject to frequent changing and storage of combustible packaging and storage aids is excluded from this category.

6-107. Fire Suppression Equipment (Portable Fire Extinguishers, 29 CFR 1910.157)

a. Operable condition. Portable extinguishers will be maintained in a fully charged and operable condition, and kept in their designated places at **all** times when they are not being used.

b. Location. Extinguishers will be conspicuously located where they will be readily accessible and immediately available in the event of fire. They will be located along normal paths of travel.

c. Marking of location. Extinguishers will not be obstructed or obscured from view. In large rooms, and in certain locations where visual obstruction cannot be completely avoided, means will be provided to indicate the location and intended use of extinguishers conspicuously.

d. Marking of extinguishers. If extinguishers intended for different classes of fire are grouped, their intended use will be marked conspicuously to ensure choice of the proper extinguisher at the time of a fire.

e. Mounting of extinguishers. Extinguishers will be installed on the hangers or in the brackets supplied, mounted in cabinets, or set on shelves unless the extinguishers are of the wheel type.

f. Height of mounting. Extinguishers having a gross weight not exceeding 40 pounds **will be installed** so that the top of the extinguisher is not

more than 5 feet above the floor. Extinguishers having a gross weight greater than 40 pounds (except wheeled types) will be so installed that the top of the extinguisher is not more than **3½** feet above the floor.

g. Cabinet mounting. Extinguishers mounted in cabinets or wall recesses or set on shelves **will be** placed in a manner such that the extinguisher **operating** instructions face outward. The location of such extinguishers will be marked conspicuously.

h. Vibrating locations. Extinguishers installed under conditions where they are subject to severe vibration will be installed in brackets specifically designed to cope with this vibration.

i. Temperature range. Extinguishers will be suitable for use within a temperature range of at least plus 40° F to 120° F.

j. Extreme temperature exposure. When extinguishers are installed in locations subjected to temperatures outside the range prescribed in this subparagraph, they will be of a type approved or listed for the temperature to which they will be exposed, or placed in an enclosure capable of maintaining the temperature within the range prescribed in this subparagraph.

k. Selection of extinguishers. The selection of extinguishers for a given situation will depend upon the character of the fires anticipated, the construction and occupancy of the individual property, the vehicle or hazard to be protected, ambient temperature conditions, and other factors. The number of extinguishers required will be determined by reference to paragraph *m.* below of this section. Approved **fire** extinguishers will be used to meet the requirements of this section.

Note. Approved means listed or approved by (1) At least one of the following nationally recognized testing laboratories: Factory Mutual Engineering Corp; Underwriters' Laboratories, Inc., or (2) Federal agencies such as Bureau of Mines, Department of the Interior; Department of Transportation, or US Coast Guard, which issue approvals for such equipment.

l. Selection by hazard. Extinguishers will be selected for the specific class or classes of hazards to be protected in accordance with the following:

(1) Extinguishers for protecting Class A hazards will be selected from among the following: foam, loaded stream, multipurpose dry chemical, and water types. Certain smaller extinguishers which are charged with multipurpose dry chemical are rated on Class B and Class C fires, but have

insufficient effectiveness to earn the minimum 1-A rating even though they have value in extinguishing smaller Class A fires. Such smaller extinguishers **will** not be used to meet the requirements of paragraph *m* below of this section.

(2) Extinguishers for protection of Class B hazards will be selected from the following: bromotrifluoromethane, carbon dioxide, dry chemical, foam, loaded stream, and multipurpose dry chemical. Extinguishers with ratings less than 1-B shall **not be considered** in determining suitability.

(3) Extinguishers for protection of Class C hazards will be selected from the following: bromotrifluoromethane, carbon dioxide, dry chemical, and multipurpose dry chemical.

Note. Carbon dioxide extinguishers equipped with metal horns are not considered safe for use on fires in energized electrical equipment and, therefore, are not classified for use on Class C hazards.

(4) Extinguishers and extinguishing agents for the protection of Class D hazards will be approved for use on the specific combustible metal hazard.

m. Distribution of portable fire extinguishers.

(1) The number of fire extinguishers needed to protect a property will be determined as prescribed herein, considering the area and arrangement of the building or occupancy, the severity of the hazard, the anticipated classes of fires, and the distances to be traveled to reach extinguishers.

(2) Fire extinguishers will be provided for the protection of both the building structure, if combustible, and the occupancy hazards contained therein.

(3) Required building protection will be provided by fire extinguishers suitable for Class A fires.

(4) Occupancy hazard protection will be provided by fire extinguishers suitable for such Class A, B, C, or D fire potentials as may be present.

(5) Extinguishers provided for building protection may be considered also for the protection of occupancies having a Class A fire potential.

(6) Combustible buildings having an occupancy hazard subject to Class B, and/or Class C fires, will have a standard complement of Class A fire extinguishers as required by table 1 for building protection, plus additional Class B and/or Class C extinguishers. Where fire extinguishers have more than one letter classification (such as 2-A; 20-B; C), they may be considered to satisfy the requirements of each letter class.

(7) Rooms or areas will be graded generally as light hazard, ordinary hazard, or extra hazard. Limited areas of greater or lesser hazard will be protected as required.

n. Fire extinguisher size and placement for Class A hazards.

(1) Minimal sizes of fire extinguishers for the listed grades of hazard will be provided on the basis of table 6-1. Extinguishers will be located so that the maximum travel distances will not exceed those specified in table 6-1.

(2) The protection requirements specified in table 6-1 may be fulfilled by several extinguishers of lower ratings for ordinary or extra hazard occupancies.

(3) Where the floor area of a building is less than that specified in table 6-1, at least one extinguisher of the minimum size recommended will be provided.

(4) The protection requirements may be fulfilled with extinguishers of higher rating provided

Table 6-1.

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

Note 1. Not permitted except as specified in (2) below.

Table 6-2

<i>Type of hazard</i>	<i>Basic minimum extinguisher rating</i>	<i>Maximum travel distance to extinguishers (feet)</i>
Light ordinary	4B	50
ordinary	8B	50
Extra	12B	50

Note. Where this section calls for minimum extinguisher ratings of 4B, 8B, or 12B, the requirements may be met by existing extinguishers of multiple foam extinguishers as allowed by o(2) above. However, if a single extinguisher must be purchased to fulfill such requirements, the next higher rating will be used.

the travel distance to such larger extinguishers will not exceed 75 feet.

o. Fire extinguisher size and placement for Class B fires other than for fires inflammable liquids of appreciable depth.

(1) Minimal sizes of fire extinguishers for the listed grades of hazard will be provided on the basis of table 6-2. Extinguishers will be located so that the maximum travel distances will not exceed those specified in table 6-2.

(2) Two or more extinguishers of lower rating, except for foam extinguishers, will not be used to fulfill the protection requirements of table 8-2. Up to three foam extinguishers may be used to fulfill these requirements.

(3) The protection requirements may be fulfilled with extinguishers of higher ratings provided the travel distance to such larger extinguishers shall not exceed 50 feet.

p. Fire extinguisher size and placement for Class B fires in flammable liquids of appreciable depth.

(1) For flammable liquid hazards of appreciable depth (Class B), such as in dip or quench tanks, Class B fire extinguishers will be provided on the basis of one numerical unit of Class B extinguishing potential per square foot of flammable liquid surface of the largest tank hazard within the area.

Note. Appreciable depth is defined as a depth of a liquid greater than one-quarter inch.

(2) Two or more extinguishers of lower ratings, except for foam extinguishers, will not be used in lieu of the extinguisher required for the largest tank. Up to three foam extinguishers may be used to fulfill these requirements.

(3) Scattered or widely separated hazards will

be individually protected if the specified travel distances in o(1) and o(3) above are exceeded. Likewise, extinguishers in the proximity of a hazard will be carefully located so as to be accessible in the presence of a fire without undue danger to the operator.

q. Fire extinguisher size and placement for Class C hazards.

Extinguishers with Class C ratings will be required where energized electrical equipment may be encountered which would require a nonconducting extinguishing media. This will include fire either directly involving or surrounding electrical equipment. Since the fire itself is a Class A or Class B hazard the extinguishers are sized and located on the basis of the anticipated Class A or B hazard.

r. Inspection, maintenance, and hydrostatic tests.

(1) General. For details of conducting needed inspections, proper maintenance operations, and required tests, see NFPA No. 10A-1970, Maintenance and Use of Portable Fire Extinguishers.

(2) *Inspection.*

(a) Extinguishers will be inspected monthly, or at more frequent intervals when circumstances require, to ensure they are in their designated places, to ensure they have not been actuated or tampered with, and to detect any obvious physical damage, corrosion, or other impairments.

(b) Any extinguishers showing defects will be given a complete maintenance check.

(3) *Maintenance.*

(a) At regular intervals, not more than 1 year apart, or when specifically indicated by an inspection, extinguishers will be thoroughly examined

and/or recharged or repaired to ensure operability and safety, or replaced as needed.

(b) Extinguishers removed from the premises to be recharged will be replaced by spare extinguishers during the period they are gone.

(c) Pails or drums of powder-extinguishing agents for scoop or shovel application to metal fires will be kept full at all times.

(d) Each extinguisher will have a durable tag securely, attached to show the maintenance or re-charge date and the initials or signature of the person who performs this service.

(4) **Hydrostatic tests.**

(a) If, at any time, an extinguisher shows evidence of corrosion or mechanical injury, it will be subjected to a hydrostatic pressure test, or replaced.

(b) For evaluating the condition of extinguisher cylinders made to Department of Transportation specifications (49 CFR, chap. 1), see the Standard for Visual Inspection of Compressed Gas Cylinders (CGA C-6), published by the Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.

(c) At intervals not exceeding those specified in table 6-3 and (d) of this subparagraph, extinguishers will be hydrostatically tested. The first

hydrostatic retest may be conducted between the fifth and sixth years for those with a designated test interval of 5 years.

(d) Nitrogen cylinders (or other cylinders used for inert-gas storage), such as found on wheeled extinguishers, will be tested at a 5-year interval.

(e) On those extinguishers which are equipped with a shutoff nozzle at the outlet end of the hose, a hydrostatic test will be performed on the hose with its couplings (but without the discharge nozzle) at the test interval specified for the unit on which the hose is installed.

(f) The test pressure for dry chemical and dry powder hose assemblies requiring a hydrostatic test will be at a test pressure of 300 pounds per square inch for a 1-minute period. Carbon dioxide hose assemblies requiring a hydrostatic test will be at test pressure of 1,250 psi for a 1-minute period.

(g) Hydrostatic tests are not required on fire pails, pumptype water and/or antifreeze extinguishers, and factory-sealed disposable (nonrefillable) containers. If such an extinguisher or water pail shows evidence of corrosion or mechanical injury, it maybe unsafe or unsuitable for further use and will be replaced with a new unit.

(h) The hydrostatic test date will be recorded

Table 6-3. Hydrostatic test interval for extinguishers

<i>Extinguisher type:</i>	<i>Test interval year</i>
Cartridge-operated water and/or antifreeze -----	5
Stored-pressure water and/or antifreeze -----	5
Wetting agent	5
Foam -----	5
Loaded stream	5
Dry chemical extinguishera with stainless steel shells, or soldered-brass shells -----	5
Carbon dioxide extinguishera	5
Dry chemical extinguishera with brazed brass shells, mild steel shell, or aluminum shells -----	12
Bromotrifluoromethane	12
Dry powder extinguishers for metal fires -----	12

Note. Cylindera under jurisdiction of the US Department of Transportation (formerly Interstate Commerce Commission) may require hydrostatic testing at more frequent periods.

on a record tag of metal or equally durable material, or a suitable **metallized** decal which will be **affixed** (by a heatless process) to the shell of an **extinguisher** which favorably passes the hydrostatic test. The record tag will contain the following information: date of **test**, test pressure, and name or initials of person or agency making the test.

(i) For extinguishers subjected to an original factory test pressure of 350 psi or greater, the test pressure will be 75 percent of the factory test pressure (**as** noted on the extinguisher nameplate), but in no **case** less than 300 psi, see table **6-4**. For extinguishers subjected to an original factory test pressure of less than 350 psi, the test pressure will be 75 percent of the factory test pressure; see table 6-4. Pressure will be applied at a rate of rise to reach the test pressure in approximately 1 minute, and the pressure will be held for 1 minute, after which it will be released.

(j) Carbon dioxide extinguishers, nitrogen cylinders, and other cylinders or cartridges used for the storage of inert, compressed gases will be hydrostatically tested **in** accordance with the requirements of the US Department of Transportation (formerly Interstate Commerce Commission); see 49 CFR Parts 171-190.

(k) Extinguisher shells, cartridges, or cylinders which show leakage or permanent distortion in excess of specified limits, or which rupture, will be removed from service.

(5) *Characteristics of fire extinguishers.* The characteristics of **fire** extinguishers are summarized in table 6-5. The table is designed to familiarize one with the various types of extinguishers in use. The table may also be used as an aid in selecting fire extinguishers.

Table **6-4**. Hydrostatic test pressure requirements-non-ICC shells, shells not specified in **US Department of Transportation regulations**, (formerly Interstate Commerce Commission)

Extinguisher <i>type</i>	<i>Original factory test pressure</i>	<i>Requires hydrostatic test pressure</i>
All dry chemical and dry powder	400 psi or greater	75% of factory test pressure
	350-399 psi below 350 psi	300 psi 75% of factory test pressure
Foam-500 psi factory test	500	375
Foam-350 psi factory test	350	300
Stored-pressure or cartridge- operated water-typed (including antifreeze and loaded stream)	400 psi or greater	75% of factory test pressure
	350-399 psi below 350	300 psi 75%-of factory test pressure

Table 6-5. Characteristics of extinguishers

<i>Extinguishing Agent</i>	<i>Method of operation</i>	<i>Capacity</i>	<i>Horizontal range of stream</i>	<i>Approximate time of discharge</i>	<i>Hydrostatic test interval</i>	<i>Protection re- quid below 40° F</i>	<i>UL or ULC classifications*</i>
Water	Stored Pressure	2½ gal.	30-40 ft.	1 min.	5 yr.	Yes	2-A
Water	Pump	1½ gal.	30-40 ft.	45 sec.	—	Yes	1-A
	Pump	2YZ gal.	30-40 ft.'	1 min.	—	Yes	2-A

Table 6-5. Characteristics of extinguishers-Continued

<i>Extinguishing Agent</i>	<i>Method of operation</i>	<i>capacity</i>	<i>Horizontal range of stream</i>	<i>Approximate time of discharge</i>	<i>Hydrostatic test interval</i>	<i>Protection required below 40° F</i>	<i>UL or ULC classifications*</i>
	Pump	4 gal.	3040 ft.	2 min.	—	Yes	3-A
	Pump	5 gal.	30-40 ft.	2-3 min.	—	Yes	4-A
Water (Antifreeze Calcium Chloride)	Cartridge & Stored Pressure	1¼, 1½ gal.	30-40 ft.	30 sec.	5 yr.	No	1-A
	Cartridge & Stored Pressure	2½ gal.	30-40 ft.	1 min.	5 yr.	No	2-A
	Cartridge & Stored Pressure	33 gal. (wheeled)	50 ft.	3 min.	5 yr.	No	20-A
Water (Wetting Agent)	Cartridge & Stored Pressure	25 gal. (wheeled)	35 ft.	1 ½ min.	5 yr.	Yes	10-A
	Cartridge & Stored Pressure	45 gal. (wheeled)	35 ft.	2 min.	5 yr.	Yes"	20-A
Water (Soda Acid)	Chemically generated expellent	1Y4, 1½ gal.	30-40 ft.	30 sec.	5 yr.	Yes	1-A
	Chemically generated expellent	2½ gal.	30-40 ft.	1 min.	5 yr.	Yes	2-A
	Chemically generated expellent	17 gal. (wheeled)	50 ft.	3 min.	5 yr.	Yes	10-A
	Chemically generated expellent	33 gal. (wheeled)	50 ft.	3 min.	5 yr.	Yes	20-A
Loaded Stream	Stored Pressure	2Y2 gal.	30-40 ft.	1 min.	5 yr.	No	2 to 3-A and 1-B
	Cartridge and Stored Pressure	33 gal. (wheeled)	50 ft.	3 min.	5 yr.	No	20-A
Dry Chemical (Foam Compatible)‡	Cartridge and Stored Pressure	4% to 9 lbs.	5-20 ft.	8 to 10 sec.	5 or 12 yrs.	No	10 to 20-B:C
	Cartridge and Stored Pressure	9 to 27 lbs.	5-20 ft.	10 to 25 sec.	5 or 12 yrs.	No	20 to 30-B:C
	Cartridge and Stored Pressure	18 to 30 lbs.	5-20 ft.	10 to 25 sec.	5 or 12 yrs.	No	40 to 60-B:C
	Nitrogen cylinder and Stored Pressure	150 to 350 lbs. (wheeled)	15-45 ft.	20 to 150 sec.	5 or 12 yrs.	No	80 to 240-B:C
Dry Chemical (Foam Compatible) (Potassium Chloride)‡‡	Cartridge and Stored Pressure	2½ to 5 lbs.	5-12 ft.	8 to 10 sec.	5 or 12 yrs.	No	10 to 20-B:C
	Cartridge and Stored Pressure	9½ to 20 lbs.	5-20 ft.	8 to 25 sec.	5 or 12 yrs.	No	40 to 60-B:C
	Cartridge and Stored Pressure	19½ to 30 lbs.	5-20 ft.	10 to 25 sec.	5 or 12 yrs.	No	60 to 80-B:C
	Nitrogen cylinder and Stored Pressure	50 lbs. (wheeled)	1545 ft.	30 sec.	5 or 12 yrs.	No	120-B:C

Table 6-5. Characteristics of extinguishers-Continued

<i>Extinguishing Agent</i>	<i>Method of operation</i>	<i>Capacity</i>	<i>Horizontal range of stream</i>	<i>Approximate time of discharge</i>	<i>Hydrostatic test interval</i>	<i>Protection required below 40° F</i>	<i>UL or ULC classifications</i> "
Dry Chemical (Foam Compatible)	Stored Pressure	5 to 11 lbs.	11-22 ft.	13 to 18 sees.	12 yrs.	No	40 to 80-B:C
(Potassium Bicarbonate Urea based)††	Stored Pressure	17 to 19 lbs.	15-30 ft.	26 to 30 secs.	12 yrs.	No	120-B:C
		175 lbs.	70 ft. (wheeled)	62 sees.	12 yrs.	No	480-B:C
Bromotrifluoromethane	Self Expellent	2½ lbs.	4-6 ft.	8 to 10 sees.	12 yrs.	No	2-B:C
	Stored Pressure	4½ lbs.	6-10 ft.	8 to 10 sees.	12 yrs.	No	5-B:C
Bromochlorodifluoromethane	Stored Pressure	2 to 4 lbs.	8-12 ft.	8 to 12 sees.	12 yrs.	No	2 to 5-B:C
		5% to 9 lbs.	8-15 ft.	8 to 15 sees.	12 yrs.	No	10-B:C
Foam	Pressurized	21 oz.	4-6 ft.	24 sec.	.	Yes	1-B
Foam	Chemically generated expellent	1%, 1½ gal.	30-40 ft.	40 sec.	5 yr.	Yes	1-A; 2-B
	Chemically generated expellent	2½ gal.	30-40 ft.	1½ min.	5 yr.	Yes	2-A:4-B to 2-A:6-B
	Chemically generated expellent	5 gal.	30-40 ft.	2 min.	5 yr.	Yes	4-A:6-B
	Chemically generated expellent	17 gal. (wheeled)	50 ft.	3 min.	5 yr.	Yes	10-A: 10-B to 10-A:12-B
	Chemically generated expellent	33 gal. (wheeled)	50 ft.	3 min.	5 yr.	Yes	20-A: 20-B to 20-A: 40-B
Carbon Dioxide**	Self Expellent	2½ to 5 lb.	3-8 ft.	8 to 30 sec.	5 yr.	No	1 to 5-B:C
		10 to 15 lb.	3-8 ft.	8 to 30 sec.	5 yr.	No	2 to 10-B:C
		20 lb.	3-8 ft.	10 to 30 sec.	5 yr.	No	10-B:C
		50 to 100 lb. (wheeled)	3-10 ft.	10 to 30 sec.	5 yr.	No	10 to 40-B:C
Dry Chemical (Sodium Bicarbonate)††	Stored Pressure	1 lb.	5-8 ft.	8 to 10 sec.	5 or 12 yrs.	No	1-B:C
	Stored Pressure	1½ to 2½ lb.	5-8 ft.	8 to 12 sec.	5 or 12 yrs.	No	2 to 5-B:C
	Cartridge and pressure	2% to 5½ lb.	5-20 ft.	8 to 20 sec.	5 or 12 yrs.	No	5 to 10-B:C
	Cartridge and Pressure	7½ to 30 lb.	5-20 ft.	10 to 25 sec.	5 or 12 m -	No	10 to 60-B:C
	Nitrogen cylinder or Stored Pressure	75 to 350 lb. (wheeled)	15-45 ft.	20 to 105 sec.	5 or 12 yrs.	No	40 to 240-B:C

Table 6-5. Characteristics of extinguishers—Continued

<i>Extinguishing Agent</i>	<i>Method of operation</i>	<i>Capacity</i>	<i>Horizontal range of stream</i>	<i>Approximate time of discharge</i>	<i>Hydrostatic test interval</i>	<i>Protection required below 40° F</i>	<i>UL or ULC classifications*</i>
Dry Chemical (Potassium Bicarbonate) ††	Stored Pressure	1 to 2 lb.	5-8 ft.	8 to 10 sec.	5 yrs.	No	1 to 5-B:C
	Stored Pressure	2¼ to 5 lb.	5-12 ft.	8 to 10 sec.	5 or 12 yrs.	No	5 to 20-B:C
	Cartridge or Stored Pressure	5½ to 10 lbs.	5-20 ft.	8 to 20 sec.	5 or 12 yrs.	No	10 to 60-B:C
	Cartridge or Stored Pressure	16 to 30 lbs.	10-20 ft.	8 to 25 sec.	5 or 12 yrs.	No	40 to 80-B:C
Dry Chemical (Potassium chloride) ††	Nitrogen cylinder or Stored Pressure	125 to 300 lbs. (wheeled)	15-45 ft.	30 to 60 sec.	5 or 12 yrs.	No	80 to 320-B:C
	Stored Pressure	2 to 2½ lbs.	5-8 ft.	8 to 10 sec.	5 or 12 yrs.	No	5 to 10-B:C
	Cartridge or Stored Pressure	5 to 10 lbs.	5-20 ft.	8 to 25 sec.	5 or 12 yrs.	No	20 to 40-B:C
	Cartridge or Stored Pressure	19½ to 30 lbs.	15-45 ft.	8 to 25 sec.	5 or 12 yrs.	No	60 to 80-B:C
Dry Chemical (Ammonium phosphate) †‡	Nitrogen cylinder or Stored Pressure	50 to 160 lbs. (wheeled)	15-45 ft.	30 to 60 sec.	5 or 12 yrs.	No	120 to 160-B:C
	Stored Pressure †	1 to 5 lbs.	5-12 ft.	8 to 10 sec.	5 or 12 yrs.	No	2 to 10-B:C
	Stored Pressure or Cartridge	2½ to 8½ lbs.	5-12 ft.	8 to 12 sec.	5 or 12 yrs.	No	1 to 3-A and 10 to 40-B:C
	Stored Pressure or Cartridge	9 to 17 lbs.	5-20 ft.	10 to 25 sec.	5 or 12 yrs.	No	2 to 4-A and 10 to 60-B:C
Dry Chemical (Ammonium phosphate) †‡	Stored Pressure or Cartridge	17 to 30 lbs.	5-20 ft.	10 to 25 sec.	5 or 12 yrs.		3 to 20-A and 30 to 80-B:C
	Nitrogen Cylinder or Stored Pressure	50 to 300 lbs.	15-45 ft.	30 to 60 sec.	5 or 12 yrs.		20 to 40-A and 60 to 240-B:C

Notes.

*UL and ULC ratings as of December 27, 1974.

**Carbon Dioxide extinguishers with metallic horns do not carry a "C" classification.

† Some small extinguishers containing ammonium phosphate dry chemical do not carry an "A" classification.

‡ Certain pressurized types have special requirements for hydrotesting to comply with regulations of the US Department of Transportation.

6-108. Housekeeping as related to General Storage (29 CFR 1910.141)

a. *General.* Good housekeeping practices are es-

sential to safety as well as to efficient storage operations. Many potential accidents and fires are prevented when warehouses, storerooms, and out-

side storage areas are maintained in a clean and orderly condition.

b. For all areas of **storage**. All areas of storage space will have the following housekeeping rules enforced:

- (1) Provide adequate lighting.
- (2) **Keep** machines, equipment, and working surfaces clean and orderly.
- (3) Provide adequate tool storage and maintain in neat order.
- (4) Provide approved waste containers in **sufficient** number,
- (5) Remove and dispose of scrap and waste systematically.
- (6) Clean up work areas as soon as work is completed. Remove hazardous objects from floor or ground areas during work.
- (7) Remove broken straps, exposed nails, or wire from containers or unit loads.
- (8) Allow eating only in authorized places.
- (9) Keep offices and rest rooms in orderly condition.
- (10) Clean up immediately any spilled flam-

mable liquids, greases, or other dangerous or slippery substances from working floors or paved areas (fig. 6-1).

(11) Use containers, pallets, and units of sound construction only.

(12) Maintain proper and safe storage of hazardous packing materials such as excelsior, sawdust, wood cellulose, preservative liquids, and chemicals.

(13) Provide ample space in aisles and work areas and avoid congestion.

(14) Eliminate tripping hazards such as telephone, light, and power cables.

(15) Place flammable waste (such as oily rags, steel wool, and sweepings of excelsior) in special covered metal containers and dispose of regularly. Ashes will be placed in noncombustible containers.

(16) Store dunnage material in an orderly manner.

(17) Provide regular inspections by supervisory personnel for unsafe conditions, unsafe acts, and cleanliness.

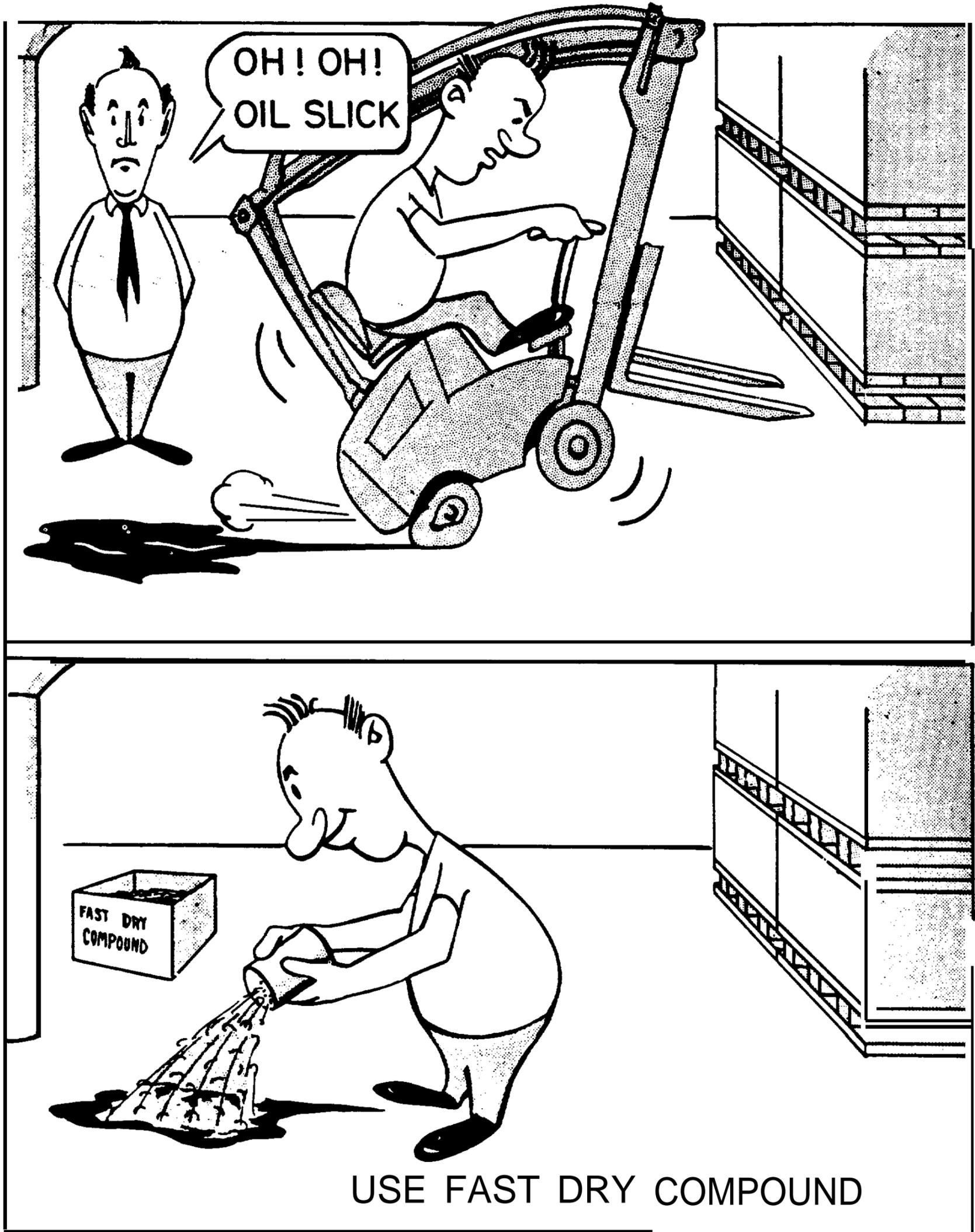


Figure 6-1. Maintain safe working areas.

(18) Maintain adequate emergency fire fighting equipment and access thereto.

(19) Remove ice, snow, or sleet from outside walkways, ramps, docks, and stairways, or spread sand, **fine** gravel, or fine cinders to prevent slipping. **Usually** ice is treated **first** with calcium chloride or sodium chloride to prevent the sand from blowing off.

c. *For inside storage areas (additional precautions).* The following precautions will be enforced for **inside** storage areas:

(1) **All doors** and windows in warehouses **should** be kept "closed and locked when work is not being done near them or when not required to be open for ventilation.

(2) Except when authorized in offices or rest rooms, do not allow smoking within warehouses. Assure that "No Smoking" signs are posted in locations where smoking is not permitted.

(3) Maintain, as required, proper clearances at fire doors, near overhead sprinklers, and bulkheads.

(4) Floors should be kept dry.

(5) Keep hose, cable, and wire off floors and remove from walkways and work areas.

(6) Parking of powered materials handling equipment in warehouses will be in accordance with the provisions of paragraph 6-112b(8)(b).

(7) Store gasoline or other highly flammable liquids, in small quantities for station use only, in flammable type warehouses or in special nonflammable small structures, only when safe containers are used and in locations approved by the fire chief or safety officer.

(8) Prohibit smoking near warehouse doors and entrances to prevent a **discarded** lighted cigarette or cigar being blown in through open doorways or under closed doors.

(9) Use soap and hot water to clean decks and floors. Gasoline, naphtha, thinners, or other highly flammable materials will not be used.

(10) Assure that floor elevation differences and other **fixed** stumbling and tripping hazards are clearly indicated.

(11) Park two-wheel hand trucks with handles in upright position and in a location where fellow workers will not stumble over them.

(12) Do not block or otherwise make established fire doors inoperative.

d. *Wash and locker room-s.* The following good

housekeeping conditions should be enforced for wash and locker rooms:

(1) Clean rooms regularly.

(2) When a disinfectant is used, add directly to the wash water. A germicidal type disinfectant may be used in addition to, and not in place of, soap and water.

(3) Clean floors and fixtures daily using soap and hot water. After cleaning, remove all soapy water **from** the floors.

(4) Where salt water is used in closets and urinals, or where the water supply is likely to contain grit, a strainer should **be** connected to the supply line to prevent grit or dirt from reaching the valves. Clean the strainers regularly.

Note. TM 5-506, NAV FAC **MO-125**, AFM 91-2 give further guidance in wash and locker room care.

e. *Lockers.* The following restrictions will be enforced for lockers:

(1) Provide two lockers for each employee working with open containers of lead compounds or other poisonous or toxic materials, one for street clothes and the other for work clothes.

(2) Old clothes and miscellaneous articles will not be stored on top of lockers.

(3) Oil soaked or badly soiled cloths will not be stored in lockers.

f. *For outside storage areas (additional precautions).*

(1) **Smoking prohibited.** Smoking will not be allowed in immediate outside storage areas; within areas where lumber, gasoline, and other petroleum products are stored; and within specified distances of boundaries of such areas. Assure that "No Smoking" signs are posted in locations where smoking is not permitted.

(2) Frequent inspections will be conducted in all open **storage** areas. Particular attention will be focused on stability of stacks of steel and lumber, potential causes of fire in lumber storage, leaking solvent, paint or petroleum product containers, bulging drums due to expansion of liquids under high temperatures, and other similar unsafe conditions. The storage area will be inspected for encroaching vegetation. Vegetation, including dry weeds, will be cleared away from outside storage area.

(3) **Life preservers at docks and piers.** At docks and piers where depth of water is a possible hazard, should personnel fall overboard, life preservers will

be maintained at 200-foot intervals at all times. Life preservers and belts will be provided at work areas where personnel work over water.

6109. Rules for Safe Storage

a. General.

(1) **All materials.** All materials (**palletized** or **unpalletized**) will be placed and secured in a safe manner.

(2) **Pallet loads.** All pallet loads will be squared to achieve a four-point level top. Superimposed loads will be set squarely and firmly to preclude **rocking** or tipping. When loads have voids, the perimeter units will be placed at or near pallet edges. (A four-point load is one which provides four points of contact, level with each other at top, at or near the four sides of pallet.)

(3) **Partially loaded pallets.** Partially loaded pallets will be stored in pallet racks or at top of stacks. A full load will not be superimposed on a partial load and a large load will not be superimposed on a small load. Heavy loads will not be stored on top of a light load or on material which could be broken or damaged.

(4) **Nonsecured top loads.** Nonsecured top loads of tall cylindrical units stacked on end, or any type of unit which has a tendency to lean or settle outwards, will be tied with cord or tape; or, in **multiple** course top loads, a piece of fiberboard or tipping paper should be laid horizontally between the two upper courses of units. When stacked vertically, loads with cylinders of compressed gas will be strapped and collared.

(5) **Unusable pallets.** **Broken** or damaged pallets will be replaced with pallets in safe condition.

(6) Use of **dunnage.** Where it is necessary to **stack** heavy materials in open storage on muddy or soft ground or on asphalt-type paved surfaces that soften in hot weather, sufficient base dunnage of broad dimensions will be provided to preclude later tipping or settling of such material.

(7) **Tying load.** In regions where strong winds prevail, noncapped or nonstrapped stacks of lumber or empty drums in open storage will be tied to prevent top units from being blown off.

(8) **Stacking clearance.** Pallet loads will be stacked with 2 inches of clearance on all sides to prevent dislocation of adjacent units.

(9) Storing of **crushable containers.** Crushable containers will have vertical supports placed in such a manner that weight of material stored above will

not be supported entirely by the containers. Unstable or odd-shaped units such as brooms; swabs, bales of rags, cloth, and **oakum**; coils of rope; or any item which may settle slowly in prolonged storage will have the top loads in proximity to each other in parallel rows. Each load will contact parts of four vertical columns or stacks of loads so that the containers may be tied at the top to prevent outward leaning of the stacks.

(10) **Moving or lifting unstable units.** To move and lift tall or unstable units on pallets, especially when heavy units could cause outward bowing of the pallet, the forks of the forklift truck will be spread as wide as possible and, when necessary, the units will be tied to prevent perimeter units from falling off the pallet.

(11) **Securing loads placed on trailers.** Loads of material placed on warehouse trailers for movement within the warehouse, between warehouses, to docks, piers, and loading platforms will be secured and tied, if necessary, to prevent material from falling off when turns are being made, when moving up or down ramps, or when crossing railroad tracks or **unlevel** surfaces.

(12) Storing of **cylindrical units.** Cylindrical units stored in horizontal position will be blocked, nested, or separated by notched horizontal spacers, as applicable,

(13) **Corner markers.** In bulk storage the use of corner markers at main and cross aisle intersections will be based upon necessity through local determination. The need for corner markers at main and cross aisle intersection should be limited to those intersections where operating materials handling equipment may damage containers or material in storage. Corner markers are not required at the main and cross aisle intersections where storage racks or bins are erected. Suggested corner marker construction is as follows and may be locally constructed:

(a) Plywood of $\frac{1}{2}$ to $\frac{3}{4}$ inch thickness is a good material for corner markers. If markers are for outside storage areas, exterior-type plywood should be used. Other products, such as sheet metal, hardboard, or particle board can be considered if cost effective under local conditions. The use of hinges to join the two wings of the corner markers will make it easier to move and store the markers when necessary.

(b) Corner markers may be triangular, square, or rectangular. Triangular shapes are the most eas-

ily identified shapes to denote corner markers, and are the most economical to construct. However, square or rectangular shapes offer more surface area for visual attention and physical protection against MHE and should be considered for use in bulk storage areas.

(c) Markers should not be less than 30 inches high or 24 inches wide (along one wing). No maximum size is established, but a square marker that measured 48 inches along each side would be considered a large size.

Note. Two or three inches could be removed from each sharp point to reduce splintering.

(d) Alternating yellow and black diagonal stripes 3-5 inches wide will be painted on each wing of the corner marker. The yellow should be color number 13538 or 13655, and should be the predominant color on the marker, i.e., if there is room for seven stripes, four stripes will be yellow and three stripes will be black. If corner markers are also used as row markers, it is permissible to have a suitable area on the markers reserved for a numbering system.

(14) *Loose straps and protruding nails.* Remove all loose straps or wire from units and loads in storage to prevent future injury of personnel when handling. All nails protruding from units, dunnage, or boards will be pounded level or removed.

(15) *Storing of flammable packing materials.* Provide closed bins for storing flammable packing materials pending use by the packing section.

(16) *Clear aisles and exits.* Keep aisles and exits clear at all times.

b. Floor load limits. Floor load limits will be observed whether a warehouse is of single or multi-story construction. It is the Activity Civil Engineering Officer's duty to see that floor capacities are determined and signs posted in conspicuous places stating the capacity of all floors in that area. For safety standards concerning floor loads, refer to 29 CFR 1910.22, (d) (1).

c. Spontaneous combustion. Under special conditions, certain materials generate enough heat to ignite spontaneously. Oils, lubricants, and fats when absorbed by fibrous materials such as rags, waste, and paper are particularly dangerous. Other such items are coal, brooms, oakum, jute, hemp, green fiber, sisal, skins, rubber, metal dross and turnings, leather scrap, and items containing a ni-

trocellulose base. The chief cause of fire is poor housekeeping. Paper, scrap, excelsior, and other combustible packing materials must be placed in approved containers or structures. To combat combustion, proper ventilation must be provided at all times. Spontaneously combustible materials will be segregated from each other and from other flammable materials.

d. Adequate illumination in storage areas. Adequate lighting in storage areas decreases hazard of accidents and enhances workers' health and morale. Adequate lighting minimizes sight weaknesses and conserves manpower. Adequate lighting will be maintained at all times in working areas and traversed spaces. Such lighting will be free from glare caused by exposed bulbs or reflection from highly polished surfaces. Provision will be made for an adequate number of globes and reflectors to prevent glare. Lamps of proper voltage, wattage, and type for the area will be provided. Burned out globes will be replaced promptly. Globes, reflectors, and walls effecting the lighting should be kept clean at all times. Where painted areas are too dark to allow proper reflection, the walls should be painted a light shade. Lighting should be at recommended levels (see reference to documents of appropriate military department). Some types of fluorescent lamps are now approved for Class 1, Group D locations of National Fire Code (NFPA). Fluorescent lighting will never be used in flammable storage areas unless approved by Underwriters Laboratories for Class 1, Group D locations. Translucent roof panels may be used in single story buildings to aid in lighting and reduce lighting costs.

e. Safe handling and disposal of fluorescent lamps. The principal consideration in handling discarded fluorescent lamps is the need to minimize breakage. Lamps must be handled with care and whenever possible, used lamps should be stored in lamp cartons. Employees should not intentionally shatter lamps. This policy will prevent employee exposure to glass fragments and will preclude unnecessary contamination from the mercury contained in the lamps. In regard to the environment aspects of the disposal of fluorescent lamps, small quantities can routinely be disposed of in sanitary landfills. If disposal quantities exceed 200 lamps per week, specific disposal instructions should be requested from the appropriate military department.

6-110. Size of Storage Blocks, Clearances, Heights, and Limitations

a. Floor area. The floor area or individual storage blocks for the combustible materials will not be limited except as indicated in chapter V, section 4.

b. Height of stacks.

(1) General. Height of stacks should not be limited except as may be required for operations stability and to maintain clearances and floor load limits.

(2) *Below automatic sprinkler deflectors.* The height of the stack below automatic sprinkler deflectors will be limited as follows:

(a) When stack heights do not exceed 15 feet, 18-inch clearance will be maintained (A, fig. 6-2).

(b) When stack heights exceed 15 feet, 36-inch clearance will be maintained (B, fig. 6-2).

(c) When hazardous commodities are involved, regardless of stack height, 36-inch clearance will be maintained.

(3) *Below joists, rafters, beams, and roof trusses.* The height of the stack below joists, rafters, beams, and roof trusses will be limited as follows (fig. 6-3).

(a) When stack heights do not exceed 15 feet, 18-inch clearance will be maintained.

(b) When stack heights exceed 15 feet, 36-inch clearance will be maintained.

(c) Regardless of their height, stacks in non-sprinkled buildings will have a 36-inch clearance, except that reclaimed metal drums may be stacked within 14 to 20 inches from metal joists, rafters, beams, and roof trusses in nonsprinkled buildings of all metal construction and without electrical wiring.

(4) *Light or heating fixtures.* Around light or heating fixtures, 18-inch clearance will be maintained.

(5) *Above level of roof truss.* When supplies are stacked above the horizontal level of lower roof truss members or beams, horizontal clearance between supplies and structural members or other installed devices will be 18 inches (fig. 6-3).

c. Clearances.

(1) *General.* Clearances between stored materials and walls will not be maintained except as follows:

(a) Substandard fire walls (less than 4-hour rating) clearance of 24 inches will be maintained (fig. 64).

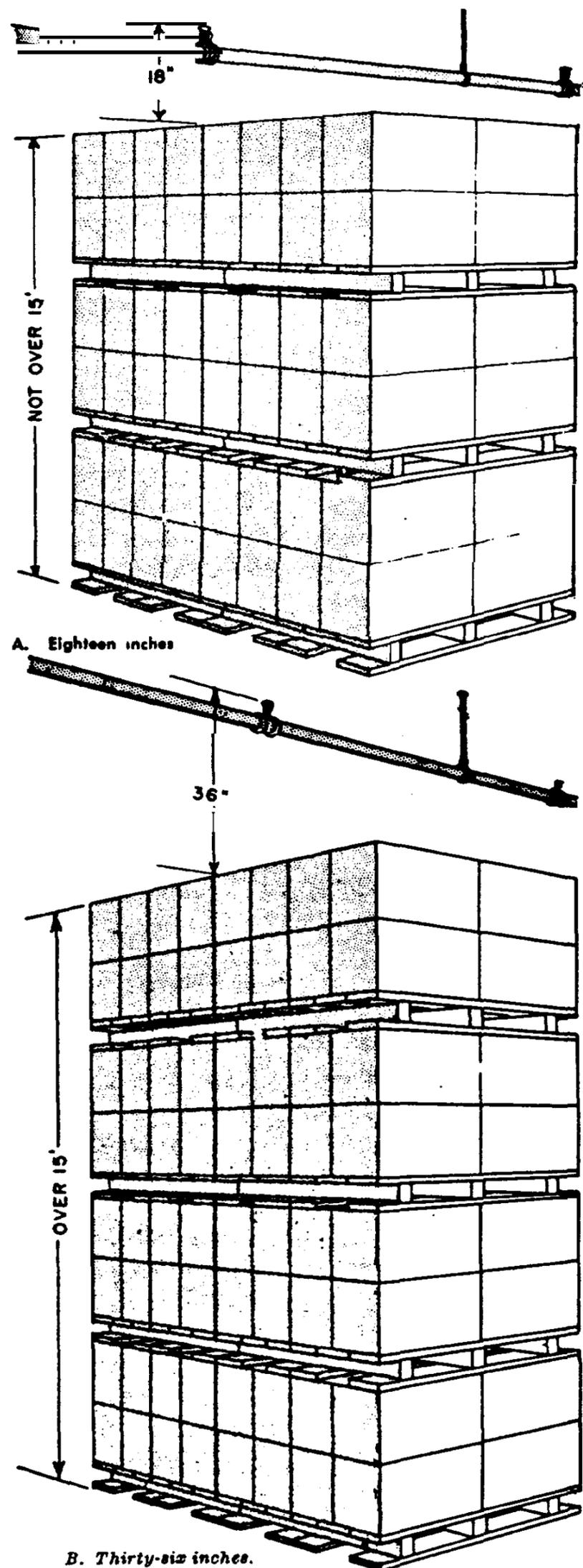


Figure 6-2. Overhead stack clearance at sprinkler head.

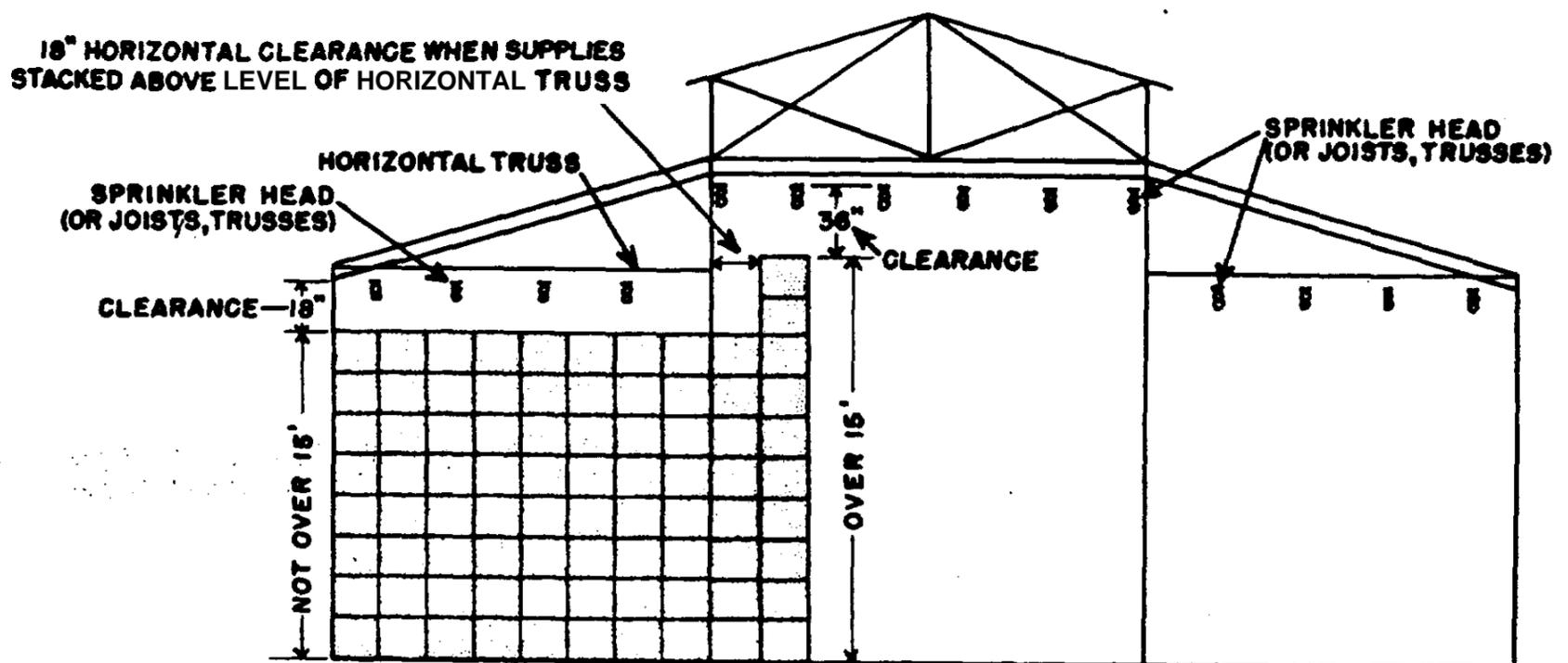


Figure 6-3. Clearance of material from sprinkler heads and trusses.

(b) When hazardous materials are stored in general purpose storage buildings, 24-inch clearance will be maintained (fig. 6-5).

(c) When nonhazardous materials are stored in general purpose storage buildings, except for personnel door or fire aisle, none (fig. 6-6).

(d) When materials stored are subject to excessive swelling, clearance usually not exceeding 12 inches (fig. 6-7).

(2) *Clearance to maintain storage block limitations.* When clearances are found necessary to maintain storage block limitations, such clearance between stacks will not be more than 4 feet in width for 2,000-square foot blocks or 6 feet for 8,000-square foot blocks.

(3) *Clearance around fire doors.* A 24-inch clearance will be maintained between stock and the fire door except for the portion of the fire door near the aisle. For this portion of the fire door, a 36-inch clearance will be maintained between stock and the fire door (fig. 6-8). Where a protective barricade is provided for the fire door, no clearance between stock and barricade is required.

d. *Action in relation to storage of combustibles.* The instructions will not be construed as directing the instigation of major rewarehousing programs to meet the requirements herein. As a general rule, compliance with these instructions will be effected in the course of normal warehousing or attrition of stocks.

e. *Aisles.* Aisles will not be maintained for access to electrical equipment, fire fighting equipment, or

sprinkler valves, except where such equipment cannot conveniently be moved to a more accessible location.

f. *Exceptions.* Exceptions to the requirements may be authorized where such exceptions will result in increasing space utilization without materially increasing the fire risk. Requests for such exceptions, with adequate justification, will be submitted to the appropriate military department for review and approval. These requirements do not apply to materials stored in public warehouses under service contracts.

6-111. Signs and Color Code Markings in Relation to Safety in Storage

a. *Posting of "No Smoking" signs.* "No Smoking" signs of sufficient size to be seen from the far end of a normal size storage room or for a considerable distance in outside storage areas will be posted. The signs will be of adequate quantity and posted in storage areas at the following locations:

(1) Over doorways, on each side of fire walls.

(2) In center of each crossaisle in each store-room, hanging double sided signs.

(3) In aisleway or lobby, hanging to face each passenger and each freight elevator entrance to warehouse.

(4) In addition, in "flammable storage" warehouses, on outside of building at each entrance, one at each end of building, and on each side of the building where there are no entrances.

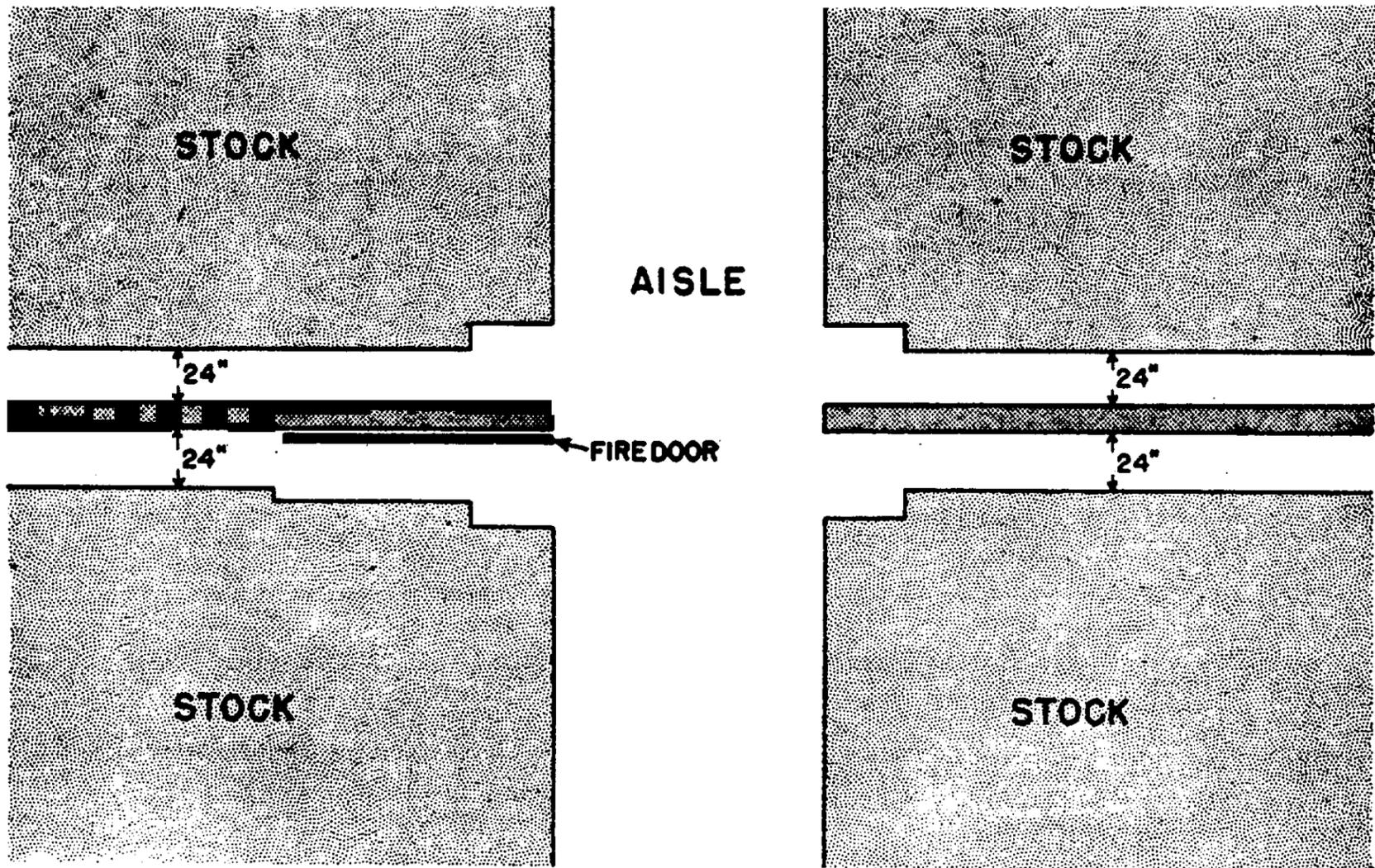


Figure 6-4. Stack clearance of substandard fire walls.

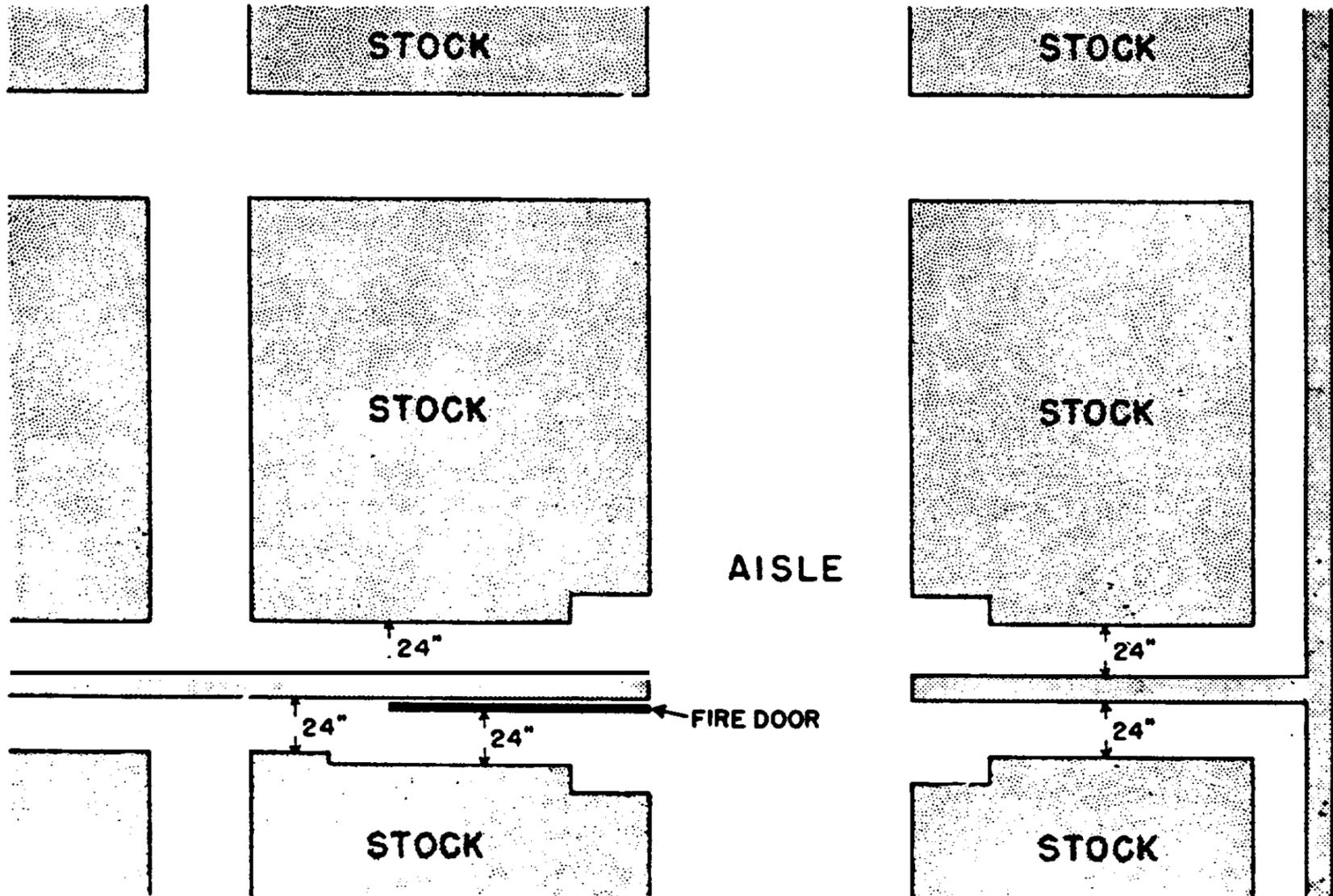


Figure 6-5. Stack clearance for hazardous materials.

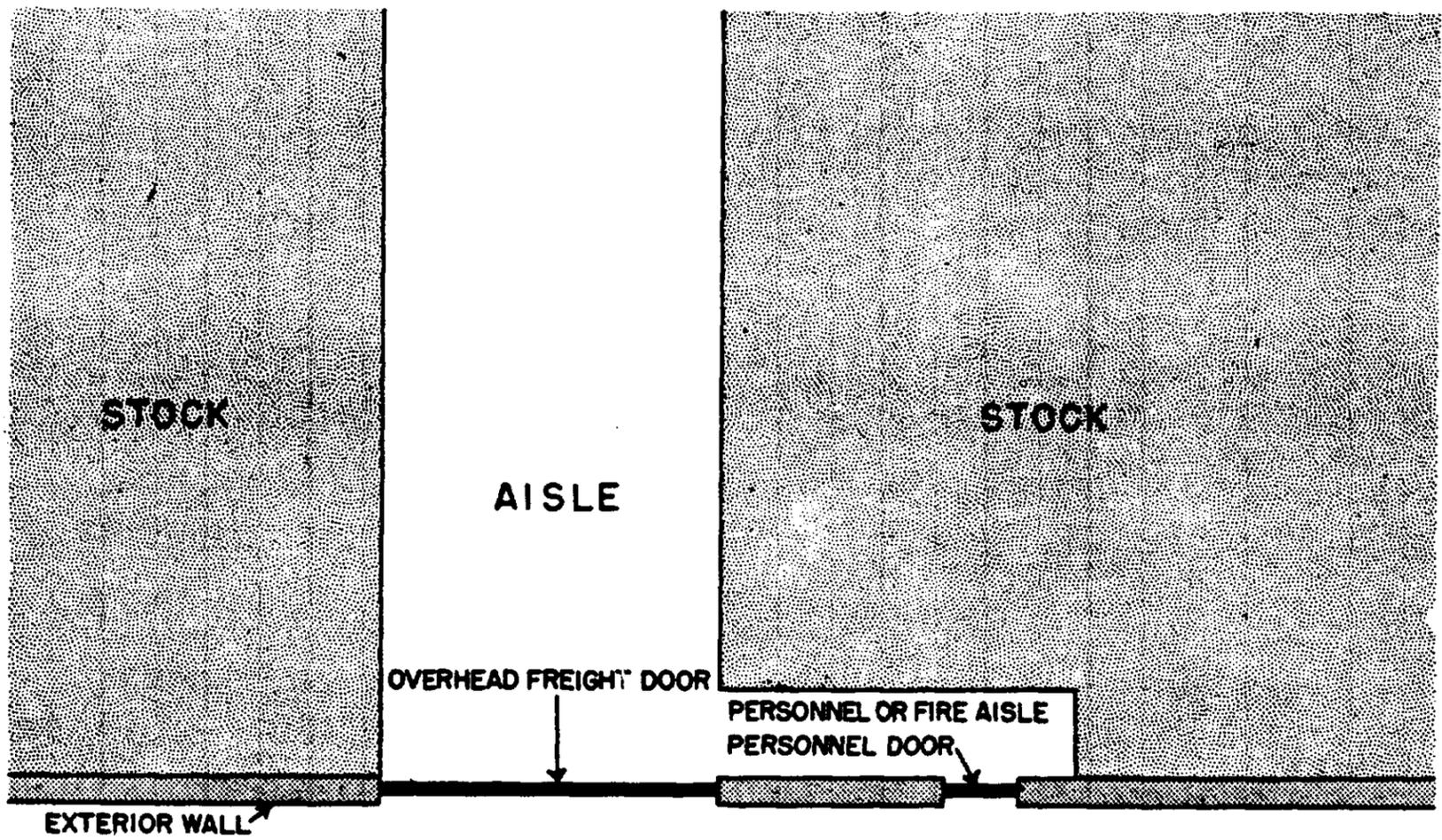


Figure 6-6. Stock clearance at exterior walls (nonhazardous materials).

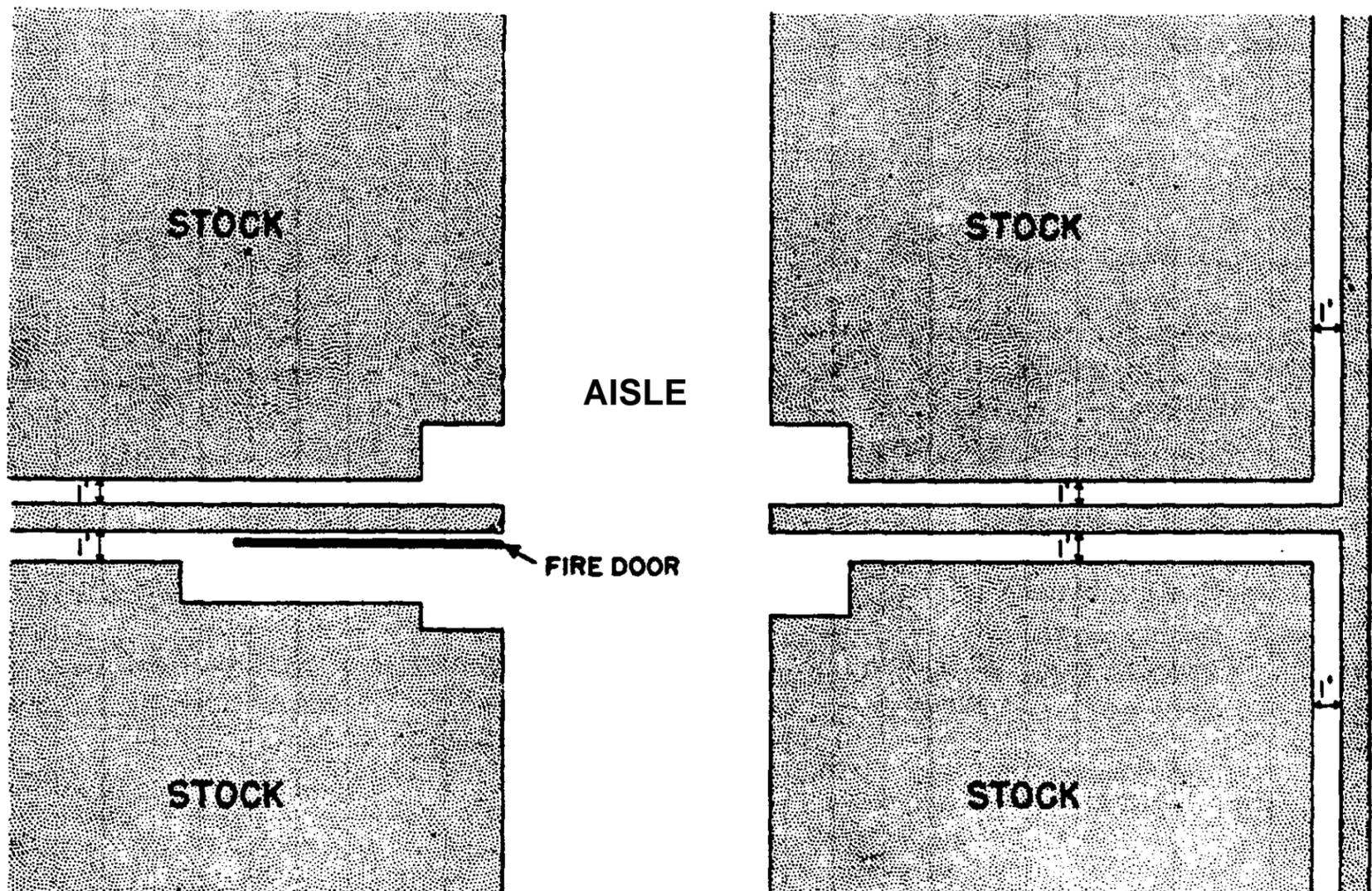


Figure 6-7. Stock clearance at walls for material subject to excessive swelling.

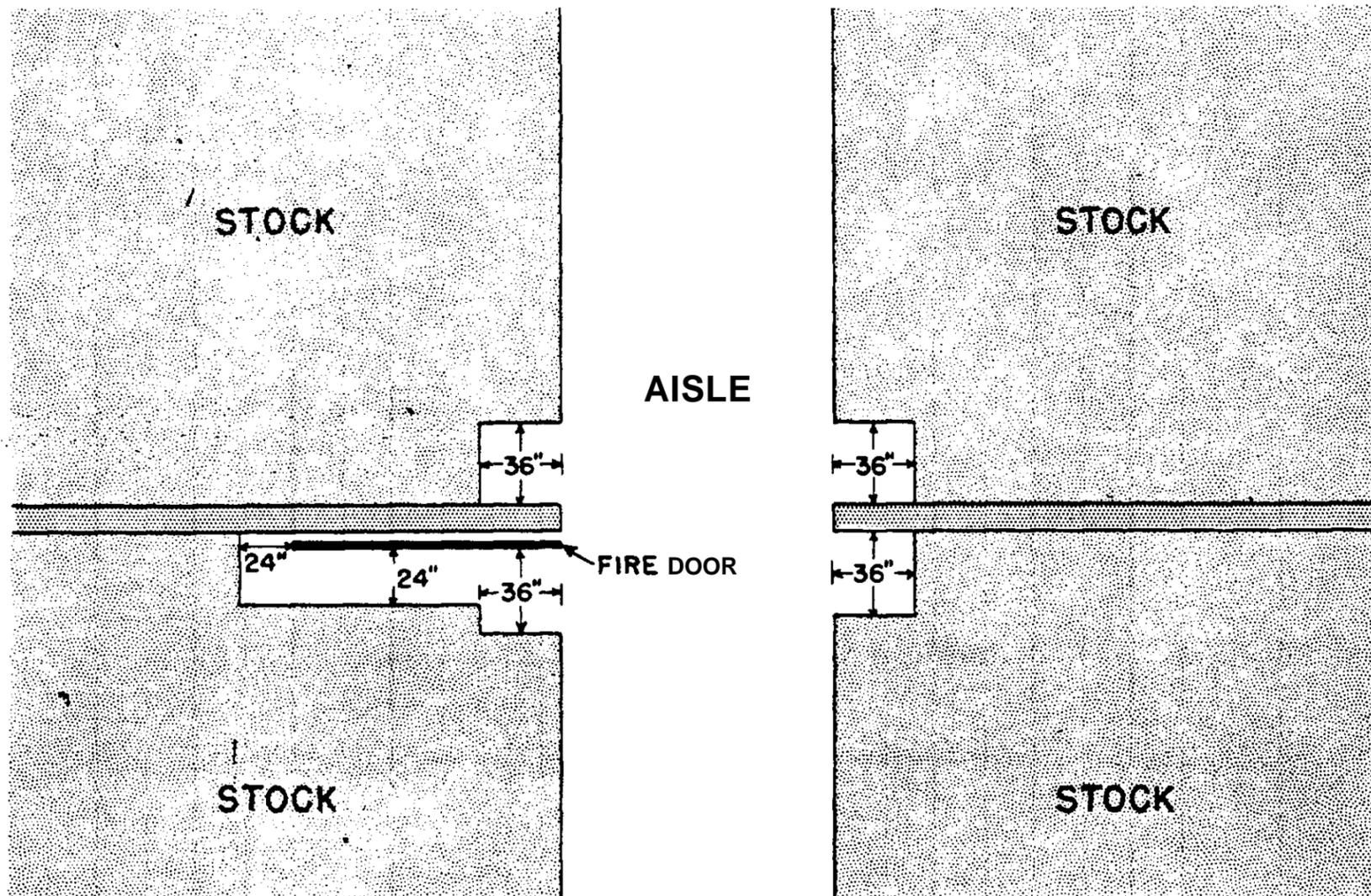


Figure 6-8. Stack clearance at standard fire walls and at fire doors (nonhazardous materials).

(5) Unusually long or wide “flammable storage” buildings will have signs posted at the ends of side and the ends of building.

(6) In aiseways of lumber yards, affixed to standards, posts or corners of stacks; in such quantity and manner as to be discernible from any direction of approach.

(7) outside areas for highly flammable materials, affixed to standards, posts or corners in aiseways so as to be discernible from any approach (areas where stores of gasoline, oils, compressed gases, acids, or materials which could prove dangerous if fire causes breakage or damage with subsequent exposure to other types of hazards, such as to danger of contact with acids and corrosives).

(8) In all outside locations, in adequate quantity where any material not especially of fire hazard is stored.

Note. Specifications for “No Smoking” signs, other warning signs, and directional arrows are found in 29 CFR 1910.144 and 1910.145.

b. *Directional arrows (OSHA 1910.145).* Directional arrows will be placed in storehouses, in aisle-

ways, where fire extinguishers or other firefighting emergency equipment is not easily discernible from a reasonable distance in the aisleway. Directional arrows, indicating placement of firefighting equipment, will be adequate size to be seen from far ends of the aisles. Also, if required, such signs will be used in outside storage areas. Directional arrows indicating the location of fire exits which are not easily discernible will be similarly posted. In this instance, the lower portion of the sign will read “FIRE EXIT.”

c. *Color code markings.* The following color codes will be used except at oversea installations when such colors are not deemed feasible.

(1) *White markings.* All floor markings which do not involve caution or hazardous areas will, when required, be painted white.

(2) *Yellow markings.*

(a) All floor markings which involve caution areas or physical hazards will be painted yellow of color chip No. 13538 or 13655, FED-STD-595.

(b) All materials handling equipment illustrated in paragraphs 4-201 through 4-214 (other

than storage aids) will be painted yellow color chip No. 13528 or 13655 except combat operational equipment which will be painted the color prescribed by the appropriate military service.

(c) **Guard** railings top and bottom stair risers will be painted with a 3-inch yellow stripe of color chip No. 13538 or 13655 under the nosing of each tread.

(3) *Yellow and black striping.* Yellow color chip No. 13538 or 13655 used with black paint to form stripes will be used to highlight particular hazardous environment by providing contrasting background as in the following examples:

(a) **Large** machinery and moving parts thereof.

(b) Pit and platform edges.

(c) Obstructions, dead ends, barricades and curbings.

(d) **Corner** markers for stacks of stored materials striped in such a way as to form an inverted V (pars 6-109a(13)).

(4) *Yellow and black checkerboard symbol.* Eye hazardous areas will be marked by permanent screens, door jambs, and floor markings or by portable signs and screens. All of these will display a black and yellow checkerboard symbol and the phrase "Eye Hazard." Portable signs should be used to warn personnel of eye hazardous operations such as welding, acid handling, and other operations which generate flying particles.

(5) Yellow *with black lettering.* Small containers for flammable liquids will be painted red with the contents indicated in yellow lettering. The contents of fixed tanks will be identified with black lettering on background of yellow color chip No. 13538 or 13655. These liquids include gasoline, naphtha, kerosene, alcohol, and solvents.

(6) *Red.* The locations of fire extinguisher and other emergency firefighting equipment and accessories will be identified by painting walls behind and floor below such equipment with paint color chip No. 11105, red, of FED-STD-595. Emergency stop devices or hazardous machinery or tools will be painted red for easy and immediate recognition.

(7) *Exit Identification.* Types and locations of exit identification media, when required, will be prescribed by 29 CFR 1910.35, 36, 37.

(8) *Special purple and yellow.* Areas used for storage of items containing radioactive materials will be conspicuously marked with special purple (magenta) and yellow as indicated in Military Standard MIL-STD-1458. Placards bearing the standard

radiation symbol will be placed at each entrance to a radioactive storage area and around the perimeter so that at least one placard is clearly visible from any direction of approach, as shown in "Radioactive Commodities in The DOD Supply Systems" (DLAM 4145.8/AR 700-64/NAVSUP PUB 50 12/AFM 67-8/MCO P4400.105).

6-112. Safety Practices for Powered Materials Handling Equipment (29 CFR 1910.176; 1910.178; 1910.179; 1910.180; 1910.181)

a. *General.* Safety practices for powered materials handling equipment will be followed and the operators will be trained in the use of equipment. The following regulations will be established:

(1) Operators will be trained under the prescribed training program established for the operation of such equipment and will pass all physical and aptitude examinations required.

(2) The proper type of equipment will be used for the specific job involved.

(3) Equipment will be of the correct rated load capacity for the weight of material to be handled.

(4) Equipment will be properly serviced and maintained at all times to assure maximum safety and efficiency in its operation.

b. *Operating safety rules.*

(1) *Spark enclosed electric equipment (29 CFR 1910.178).* Battery powered, EE type (spark enclosed) equipment will be used for handling and storing flammable liquids with a flash point of 100° F or lower in sealed containers. This type of equipment should also be used for handling other flammable liquids with flash points higher than 100° F as determined by the safety and fire prevention authorities. The need for an EX type of explosion-proof truck will be determined by the safety and fire prevention authorities of the individual military services.

(2) *Equipment to be kept free of grease.* Steering columns and electrical wiring on diesel, gasoline, or electric powered equipment must be kept free of excessive grease accumulation at all times.

(3) *Special protective equipment.* Special protective equipment as cleared by the appropriate military department will be used when work involves explosives and ammunition.

(4) *Fire prevention devices.*

(a) *Sediment bowls and gas caps.* Gasoline and gas-electric powered materials handling equip-

ment will be equipped with metal sediment bowls and gas filler caps with special safety features.

(b) **Spark or flame arrestor.** Internal combustion engine powered materials handling equipment with built-in devices to provide adequate safeguards against spark or flame will be used, when available, to handle, or to operate in storage areas containing readily ignitable materials such as cotton, jute, sisal, coca fibre or excelsior. When such MHE with built-in devices is not available, a spark or flame arrestor device, conforming to the requirements of military specification MIL-A-27302, may be attached to the muffler tail pipe. These devices require periodic inspection for accumulation of carbon deposits and, when necessary, will be removed for cleaning. Intervals between servicing of arrestors will vary with the condition of the engine and the type of operations performed. Other types of spark arrestors-devices may be used when authorized by the military service concerned.

(c) **Fire extinguishers.** The installation of fire extinguishers on powered materials handling equipment will be as prescribed by the military service concerned. Requirement considerations should include criteria described in paragraph 6107.

(5) Overhead **guards** (29 CFR 1910.178). Forklift trucks of all types will be equipped with an overhead safety guard fabricated from steel. Exceptions are permitted only for forklift trucks where height of the overhead guard would deny entry of truck into work locations such as entry into vehicles being loaded or unloaded in receiving or shipping operations. In such cases, the forklift truck will be fitted with blocking devices that will not permit the forks to elevate the load higher than the operator's head. Guards and means of attachment will not interfere with the operation of the forklift truck and will not impede the operator in mounting and dismounting the truck.

(6) **Area to be free of spilled gasoline.** All spilled gasoline will be cleaned up before starting an engine. Gasoline will not be flushed down a drain unless a special drain designated for this purpose is provided. Gasoline may be flushed away in an outdoor area if temperature is above freezing and an ample supply of water is readily available and water does not create a possible hazard. If flushing is not possible or practicable, then approved absorbent material will be used to cleanup the gasoline. Sawdust, wood shavings, or rags will not be used to clean up the spilled gasoline. Metal shovel, metal

grid, or other spark producing tools will not be used in the immediate area. When cleaning up spilled gasoline in excess of 1 pint, one person will stand by with a fire extinguisher while another person does the cleaning,

(7) **Safety precautions by the operator.** The following safety precautions are applicable for the operator of materials handling equipment:

(a) The operator, as soon as he/she goes on duty, will inspect brakes, steering apparatus, horn, oil, gas, and water. Any defects noted will be reported immediately to the supervisor.

(b) The operator will refuse to use an improperly loaded machine or one which is not in safe mechanical condition.

(c) The operator will stop the engine and set the brake before getting off the machine, except when picking stock, in which case the brake will be set and the engine permitted to idle provided the operator remains in the immediate area of the vehicle.

(d) Only licensed operators will be permitted to operate equipment (fig. 6-9).

(e) The operator will inspect all loads to be moved; will not overload; will not move an unstable load; will avoid moving loose material; and will refuse to move an unsafe load or unload from an unblocked truck or trailer.

(f) Operator will be trained in the use of all types of fire extinguishers and will ascertain their locations in the areas in which they are working.

(g) operators will keep three truck or tractor lengths behind other vehicles.

(h) The operator will face in the direction he/she is traveling, will not back without facing in that direction.

(i) The operator will slow down and sound the horn or gong before proceeding at cross aisle intersections, and when vision is obstructed by doors, corners, and elevators.

(j) The operators will not attempt to repair or adjust any mechanical part of any materials handling equipment but will immediately report defects to the supervisors.

(8) **All equipment.** The following safety operating rules are applicable to all materials handling equipment

(a) Fuel tanks on gasoline or diesel-powered equipment will not be refueled within warehouses or while the engine is running. Refueling of this equipment will be accomplished in a designated out-

side area at least 20 feet from the warehouse. The individual in charge of fueling operations will be responsible for ensuring that spilled fuel is **thoroughly** cleaned from the equipment before being driven into the warehouse. Any spilled fuel will be disposed of in accordance with (6) above.

(b) Powered materials handling equipment, not in excess of those assigned to the warehouse for normal operations, may be parked on covered truck or rail platforms or in warehouses under conditions set forth below. The selection of either place, or some **combination of** the two, will be the responsibility of the installation commander.

1. In general purpose (nonflammable storage) warehouses, powered materials handling equipment may be parked in designated locations such as vacant space in receiving or shipping areas or any large vacant area that will provide the following suitable clearances:

a. Minimum clearance of 10 feet will be maintained between the parked equipment and easily **ignitable** material such as loose combustible fibers in bales or crates.

b. A minimum 5-foot clearance will be maintained between parked equipment and boxed items or other combustible material.

2. Aisles will not be used for parking materials handling equipment during nonworking hours. This equipment will not be parked where main, cross, or fire aisles, firefighting equipment, fire alarm boxes, stairways, elevators, or fire exits will be blocked or that firefighting operations would be hampered.

3. Warehouse areas used for parking materials handling equipment must be approved by local **fire** and safety personnel.

4. An **oil** absorbent compound, Federal Specification P-S-863 or equal, will be used under each piece of equipment parked, to absorb oil and grease drippings from leaks **or** other sources. A metal pan may be used in conjunction with the compound. Corrective action will be taken on equipment evidencing leakage.

5. Materials handling equipment may be parked in multistory buildings; however, gasoline or diesel-powered equipment must be parked on the

first floor and the provisions of **1 through 4** above apply.

6. Only spark enclosed or explosion-proof equipment may be parked in flammable storage buildings and the provisions of **1 through 4** above apply.

7. Gasoline or diesel-powered equipment should not be "warmed up" inside the building. After starting the engine, such equipment should be driven outside the building for the "warm up" period to minimize fumes and carbon monoxide.

8. Scheduled inspections must be made to ensure that powered materials handling equipment is parked in proper locations; that the equipment is free from accumulations of excess grease and lint; and that gasoline lines, tanks, oil seals, etc., are not leaking.

(c) A gasoline or diesel-driven machine will not be used in a building, unless the building is properly ventilated, or when air conditions create excessive concentrations of carbon monoxide (**g** below).

(d) Forklift trucks or other materials handling equipment will not be equipped with a steering knob or extension to the gear **shift** lever.

(e) All powered materials handling equipment will be painted as prescribed in paragraph **6-111c(2)(b)**.

c. **Forklift truck safety rules (29 CFR 1910.178)**. The following safety rules are applicable to forklift truck operations (See figs. **6-9** and **6-10**).

(1) Forklift truck operators will slow down at all cross aisles and other passageways; when entering or leaving buildings or warehouses, the operator will come to a complete stop at the entrance, sound horn, and proceed only when the way is clear.

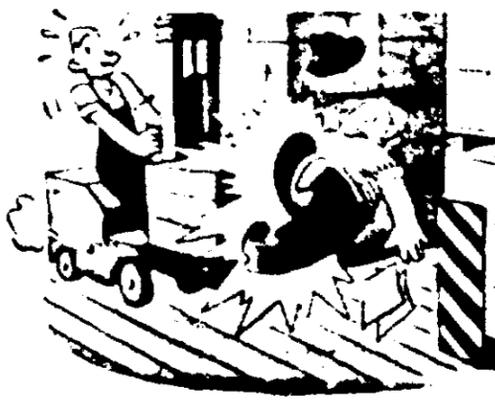
(2) Under all travel conditions the truck shall be operated at a speed that will permit it to be brought to a stop in a safe manner (29 CFR 1910.178 (N) (8)).

(3) Forklift trucks will not travel with the forks elevated more than 4 inches above the floor or ground but when parked the forks will be lowered and rest on the floor.

(4) Stacks will not be bumped or pushed with the forklift trucks to straighten or move the stack.



Never permit unauthorized persons to operate fork trucks.



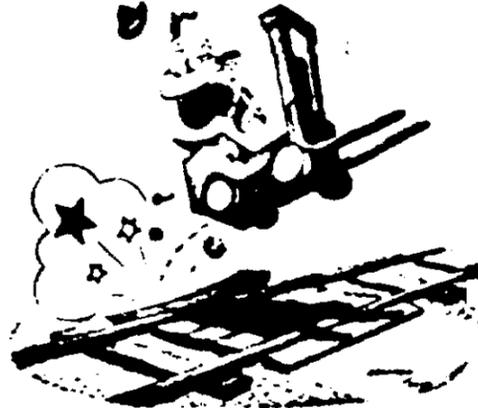
Sound horns or warning gongs at all blind intersections.



Don't overload your truck... lighten loads instead of counterweighting.



Don't descend ramps with load in front... drive down backwards at slow speed



Drive s-l-o-w-l-y over railroad tracks and rough surfaces.



Watch overhead clearance at doorway and cross beams



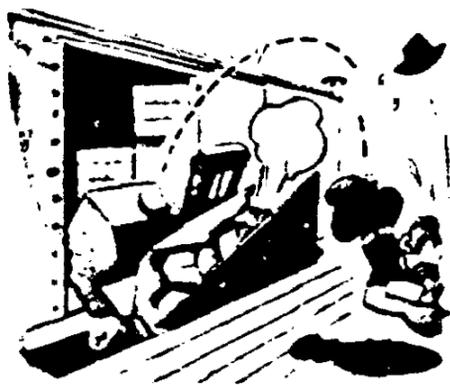
Make sure brakes are holding before leaving your fork truck



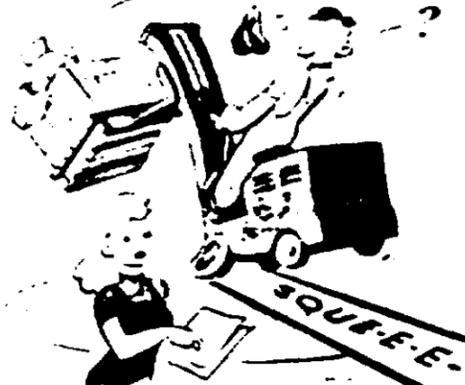
Check floor strengths carefully... don't risk fork trucks on weak floors



Don't cut corners watch your turns and prevent accidents.



Check bridge plates frequently... be sure they're secure



Don't "jam" your brakes... skid marks are signs of bad driving.



Don't attempt "minor" repairs... call a qualified repairman

Figure 6-9. Fork truck safety tips (general).

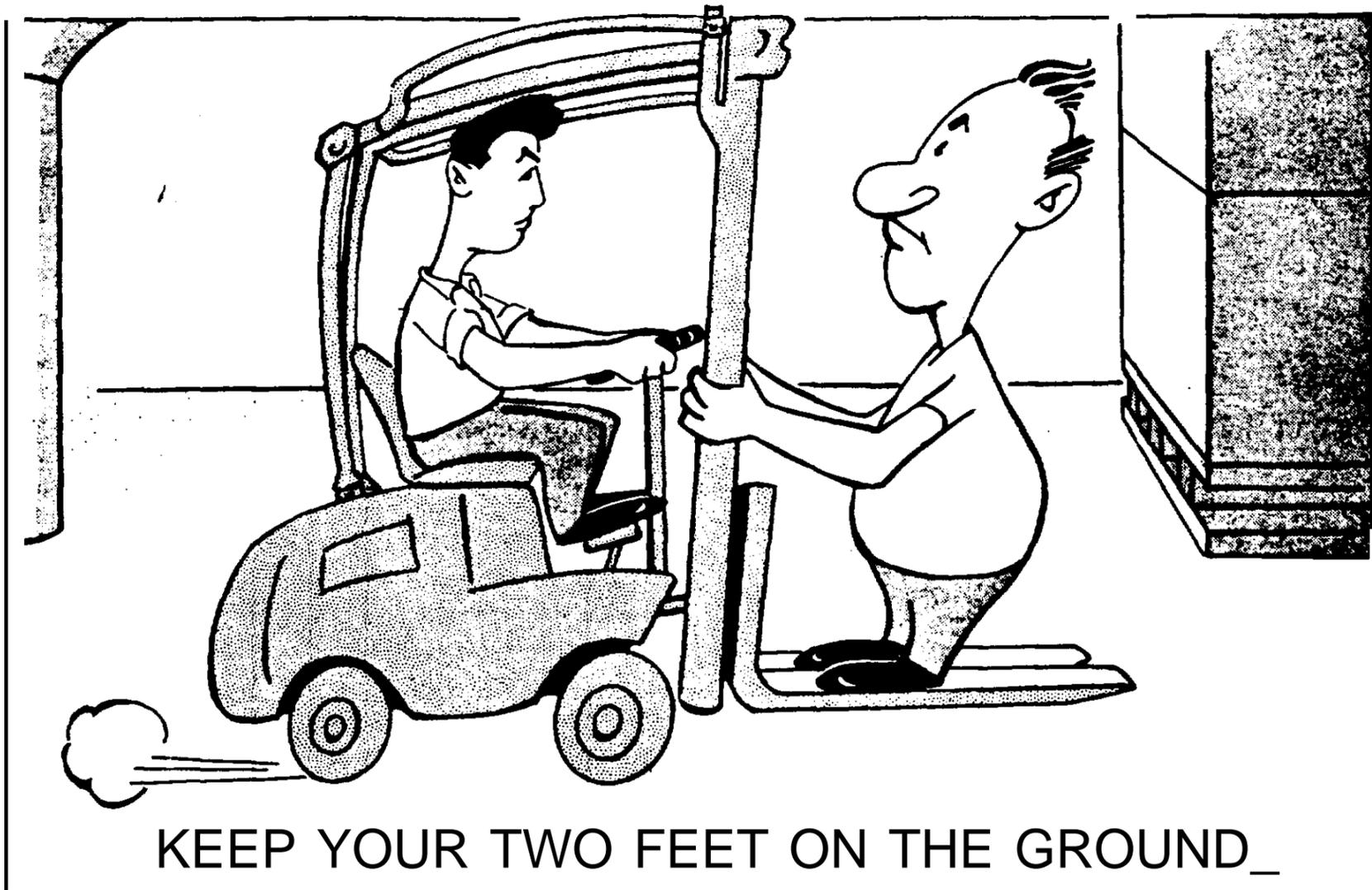


Figure 6-10. Only the operator should ride forklift trucks.

(5) The load capacity plus the gross weight of each truck will be placed on the machine at a place that is visible at all times. The capacity will not be exceeded and counter-weighting of the trucks to increase **lifting** capacity is prohibited. Modifications which affect **truck** capacity or safe operations will not be performed without the approval of appropriate installation officials.

(6) Personnel will not stand under the loads being hoisted or lowered.

(7) Forklift trucks **will** be driven forward when **transporting cargo** Up ramps or other grades and will be **driven in** reverse *on* downgrades..

(8) The mast will be tipped back when loads are transported.

(9) Forklift trucks **will** not be lifted by the overhead guard; lifting pads will be installed when required.

(10) For operations involving more than one fork truck, vehicles will be 20 feet apart, unless two vehicles are transporting the same load.

(11) Forklift trucks **will** not be used to elevate personnel, unless authorized by the supervisor. When lifting is authorized, a safety pallet will be used; the truck will not be moved; and the person being lifted will face away from the mast and remain clear of the hoisting mechanism.

(12) Personnel will not be allowed to ride forks, machine, or load when the forklift truck is moving.

(13) Forklift trucks will be driven slowly over railroad or rough surfaces.

(14) Standard load back rests (vertical package guard) will not be removed during operations except when facility characteristics, such as curved roofs, prevent use of the load back rest. Stacking of loads on the forklift truck lines will be controlled so that no more than one-third of the height of the top tier extends above the load back rest.

(15) Overhead doorways and cross beams will be cleared by the **forklift** truck.

(16) When the operator parks a forklift truck, he/she must check the brake to be sure the truck will not move.

(17) Operators of forklift trucks must not cut corners. This practice may result in upset loads, damaged goods, and serious injury to personnel.

(18) Bridge plates will be secured in position, either by being anchored or equipped with devices which will prevent their slipping and have sufficient strength to support fork trucks (See para h(2)(h) below).

(19) Freight cars **will** not be towed or pushed with forklift trucks.

(20) Do not jam on the brakes or stop suddenly.

(21) Operators will not attempt to repair fork trucks. Notify supervisors and request a qualified repairman to make repairs.

(22) Do not allow personnel to counterbalance a load on a forklift truck by riding *rear* of machine, use a truck of greater capacity.

(23) Do not extend hand or arm through mast while in operation.

(24) Forklift **trucks will** be equipped with overhead guards.

d. *Truck straddle carry safety rules.* The following safety rules are applicable to truck straddle **carry** operation:

(1) Before starting daily operations, each truck straddle carry operator will check the vehicle thoroughly. (See chap IV **sec** 5).

(2) All **loads** placed on trucks straddle carry **will** be blocked sufficiently to prevent any part of the cargo coming in contact with the surface over which the **cargo** is **being** transported.

(3) In the vicinity of personnel, operators will sound horn or other noise making device.

(4) All approved guards and safety devices will be kept in proper repair at **all** times.

(5) **Trucks** straddle carry operated on public streets or highways will be equipped with all safety devices required by state laws.

e. *Tractor-trailer train safety rules.* The following safety rules are applicable to tractor-trailer train operations:

(1) Tractor operators will obey **all** traffic regulations at all times.

(2) Trailers will be firmly coupled to each other and to the tractor before starting operations. The couplers will be inspected at each time of coupling. Safety chains will be attached when directed by the service agency concerned.

(3) The maximum number of trailers permitted by the individual activity will not be expected in each train.

(4) **Loads** being transported by tractor-trailer trains will be lashed, if necessary, to prevent material **from** falling. Operator will inspect all loads before moving the tractor-trailer train.

(5) The trailer immediately behind the tractor will not have a load of such height as to obstruct the operator's view when he/she looks back to observe if the loads are riding safely.

(6) The speed limit of tractor-trailer trains within warehouses is 5 miles per hour and in outside areas in accordance with installation directives.

(7) When leaving or entering buildings, operators will come to a complete stop, sound horn, and proceed **only** when the way is clear.

(8) Railroad tracks and **unlevel** roadways will be traversed at reduced speed, to reduce jarring of material, and at an angle (fig. 6-11).

(9) Tractors will not be used to push or pull rail m . . .

f. Warehouse cranes safety rules. The following safety rules are applicable to warehouse crane operations: (29 CFR 1910.180)

(1) When entering or leaving warehouse, crane boom must be lowered to clear doorways and other overhead obstructions.

(2) The weight of crane and load must not exceed floor load limits.

(3) Prior to actual turning of the crane, operator must use extreme caution to swing the crane boom sufficiently to avoid posts and stacked material.

(4) Aisles must be free of refuse; obstructions which suddenly raise one side of crane will cause the suspended crane load to swing, endangering material.

(5) Suspended loads will be carried as high as possible on the crane line, without fouling topping gear, in order to reduce swinging of load. Boom will be as near perpendicular as possible.

(6) Before moving or lifting the load, the operator will ascertain the approximate weight of load to be moved in relation to crane capacity.

(7) Before moving the load the operator will determine what is to be done, where load is to go, and route to be traversed.

(8) When operator leaves the crane, a crane load will never be left suspended.

(9) Sling lines will be securely attached, spread, and centered in relation to the load and, if necessary, properly padded at edge crossings to assure safety and protection to material.

(10) Ditches, railroad tracks, and other recessed or raised crossings will be crossed at right angles to prevent undue swing of load.

g. Carbon monoxide.

(1) **Characteristics.** Carbon monoxide, a **colorless**, odorless, toxic gas, is contained in varying amounts in the exhausts of almost all internal combustion-engines. An engine with a rich mixture pro-

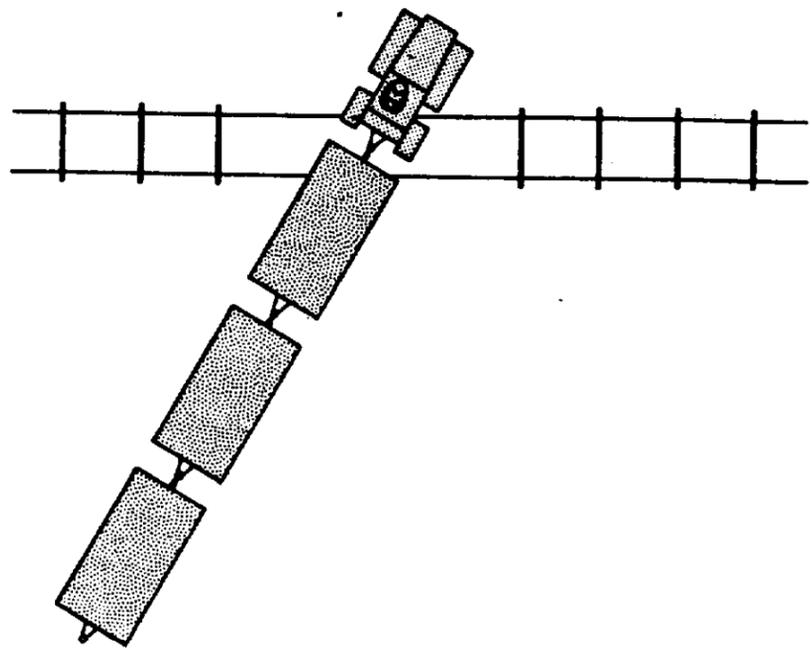


Figure 6-11. Drive slowly over mild crossings.

duces far more carbon monoxide than an engine with a lean mixture. When a cold engine is fired, the development of carbon monoxide is much greater than when firing an engine that is warm. Carbon monoxide replaces the oxygen in the blood stream, in proportion to the amount being breathed; until the concentration has built up to a considerable amount, ill effects are not experienced. Most persons may breathe each working day, without harm, air in which the concentration increases to 50 parts of carbon monoxide per **million** parts of air (time weighted average). Above that level, headaches start, and at higher concentrations, dizziness, lassitude, and general weakness are experienced. Extreme concentrations of carbon monoxide are fatal.

(2) **Ventilation.** When gasoline-driven equipment is used in confined areas where adequate natural ventilation is not available, artificial ventilation must be supplied to prevent the average concentration in any space exceeding 50 parts of carbon monoxide per million parts of air (time weighted average). Such ventilation may be obtained from ventilating systems, by portable blowers, or both.

(3) **Rate of development.** The amount of carbon monoxide developed by gasoline-driven trucks is dependent on the size of the engine, the adjustment of the carburetor, the condition of the spark plugs, and timing of the distributor. An average engine in normal operation will give off 1 cubic foot of carbon monoxide per hour per horsepower.

(4) **Atmosphere tests.** Since the value of 1 cubic foot of carbon monoxide generated per hour per horsepower is only approximate, decisions on the

amount of ventilation required for various operations should be determined by tests in working areas with appropriate carbon monoxide detectors. Such tests should be made regularly, since conditions of engines may change, and it is difficult to determine the actual amount of ventilation being furnished, particularly where natural ventilation is used.

(5) *Safety precautions.* Gasoline engines in trucks should be turned off when not in use. Gasoline engines should not be **permitted to idle in standby service for longer than 30 seconds except as provided in b(8)(c) above.** Gasoline engines should be checked at **frequent** intervals with a motor analyzer and readjusted for maximum performance and minimum carbon monoxide generation. Personnel will not be permitted to work in buildings where concentration of carbon monoxide is greater than 50 parts per million parts of air (time weighted average).

h. Auxiliary equipment.

(1) *Exhaust gas purification devices.* Exhaust gas purification devices of various types, designs and effectiveness are available from commercial sources **as** a component of an exhaust pipe or as a muffler for attachment to petroleum-fueled powered materials handling equipment and vehicles. These devices are designed, when properly attached and maintained, to prevent accumulation of lethal, toxic, and irritating exhaust gases in excess of the permissible limits established by the American Standards Association Code for Allowable Concentration of Carbon Monoxide. Normal control measures to protect health of personnel against such gases will not be relaxed when materials handling equipment, with exhaust gas **purification** devices attached thereto, are operated within enclosed and unventilated areas. Carbon monoxide detector tubes or direct reading instrumentation should be obtained and used by trained personnel to measure carbon monoxide levels. Use of petroleum fueled MHE with exhaust gas purification devices is warranted in high density confined operations only when carbon monoxide poisoning is a hazard and when battery-powered type is not available. When high density operations are performed, in closed warehouses using petroleum fueled MHE, carbon monoxide constant measuring instruments or indicators, **fixed** to area walls or mounted on mobile equipment, will be used in addition to the Detector Kit and Indicator Tube. Exhaust gas purification

device(s) will be procured and used only when authorized by the appropriate authority of the military service having jurisdiction.

(2) *Bridge plates.* Information on bridge plates (**dockboards**) is contained in 29 CFR 1910.30 and 1910.178. A bridge plate must be strong enough to support the equipment and load which traverses it and long enough to bridge the gap it spans with adequate support area at both ends. The length, especially, is important when the floor of the **platform** is lower or higher than the floor of the car or vice versa. Drive slowly when mounting or driving over the bridge plates in rainy weather, or when icy. Bridge plates will **be—**

(a) Equipped with stops at both ends near the edges of the platform or the **car** or truck to prevent plate **from** sliding.

(b) Equipped with adjustable stops of different lengths permanently located in channels or slots. Use of steel pins as stops is not authorized.

(c) Of sufficient **length** to provide support of approximately 8 inches at all times.

(d) So constructed to provide handloads for manually **lifting** or other means for lifting by fork truck.

(e) Constructed with a rough or checkered surface to reduce skidding or slipping.

(f) Equipped with safety curbs to prevent fork truck runoff.

(g) Marked to indicate the load capacity.

(h) Checked frequently during lengthy **loading/unloading** operations.

6-113. Safety practices for Nonpowered Materials Handling Equipment

a. Hand trucks.

(1) *Two-wheel hand truck.* The two-wheeled hand truck will not be used to transport units of material heavy enough to cause undue strain **or risk** to personnel.

(2) *Barrel hand truck.* Barrel-type hand trucks should be provided for personnel to move drums, large kegs of material, or other cylindrical units to prevent rolling or slipping of the material causing possible damage to material or injury to **personnel.**

(3) *Hand trucks with sparkproof wheels or rims.* Hand trucks with sparkproof wheels or **rims** will be used, only for work requiring such equipment, in areas or rooms where materials of highly **flammable**, combustible, or explosive nature are stored, or handled.

(4) *Nonpowered hand pallet truck.* **Nonpowered** hand pallet trucks will not be used to move heavy loads.

b. Use of crowbar. In areas or rooms where highly flammable, combustible, or explosive materials are stored, a **crowbar** or pinch bar will not be used to pry or move material as sparks may cause fire or explosion.

c. Standard safety pallet (29 CFR 1910.178). The standard safety pallet (described in para **4-214**) and not the **ordinary** pallet will be used with forklift **trucks** in the following operations:

(1) To elevate personnel to a sufficient height above the floor of the warehouse for the purpose of storing material on an elevated pallet or when removing individual items from elevated pallets.

(2) To elevate personnel performing maintenance work on the inside or outside of warehouses. Personnel will not be elevated on the forks of the forklift truck without the use of the safety pallet.

(3) Whenever a truck is equipped with vertical only, or vertical and horizontal controls **elevatable** with the lifting carriage or forks for lifting personnel, the following additional precautions shall be taken for the protection of personnel being **elevated**:

(a) Use of a safety platform firmly secured to the lifting carriage and/or forks.

(b) Means shall be provided whereby personnel on the platform can shut off power to the truck.

(c) **Such** protection **from** falling objects as indicated necessary by the operating conditions shall be provided.

d. Fork extension. The fork extension added to forklift trucks may reduce the load carrying capacity of a truck rated at 24-inches load center ap-

proximately 20 percent when handling 60-inch long loads (chap. IV). The fork extension should be used only in handling loads of relatively light weight.

e. Ladders. (29 CFR 1910.25; 1910.26; 1910.27; 1920.29)

(1) *Conduction.* The regular rung-type ladder will have the bottoms of side rails sheathed or covered with safety nonskid pads of corrugated or **skid**-proof rubber, duck, or other skidproof material. Nails or screws securing such pads will be countersunk. The pads should be inspected often and replaced when considered unsafe. The regular **rung**-type ladder must be constructed **so** that the **rung** ends set into notches in the rails. Only stepladders with safety hand and guard rails should be used when such ladders are necessary. Three sides of the top step of platform-type stepladders will be protected with guard rails. Stepladders should have only two wheels to preclude unsafe movement of such a ladder when in use. Wheels should be attached to back legs.

(2) Use.

(a) *Position.* For safe use, the ladder must set on a firm, solid, and level base with the top end resting squarely against the wall or other support. The distance of the foot of the ladder from the base of the wall support should be approximately **one-fourth** of the length of the ladder.

(b) *Defective ladders.* Ladders with cracked rungs or defective or cracked rails will not be used.

(c) *In front of doors.* A ladder will not be placed in front of a door unless the door is locked, or otherwise blocked, barricaded, or guarded.

(d) *Stock picking or storing.* Ladders should not be used when stock picking or storing in bin racks; the stock pickers cart described in chapter IV will be used (fig. 6-12).

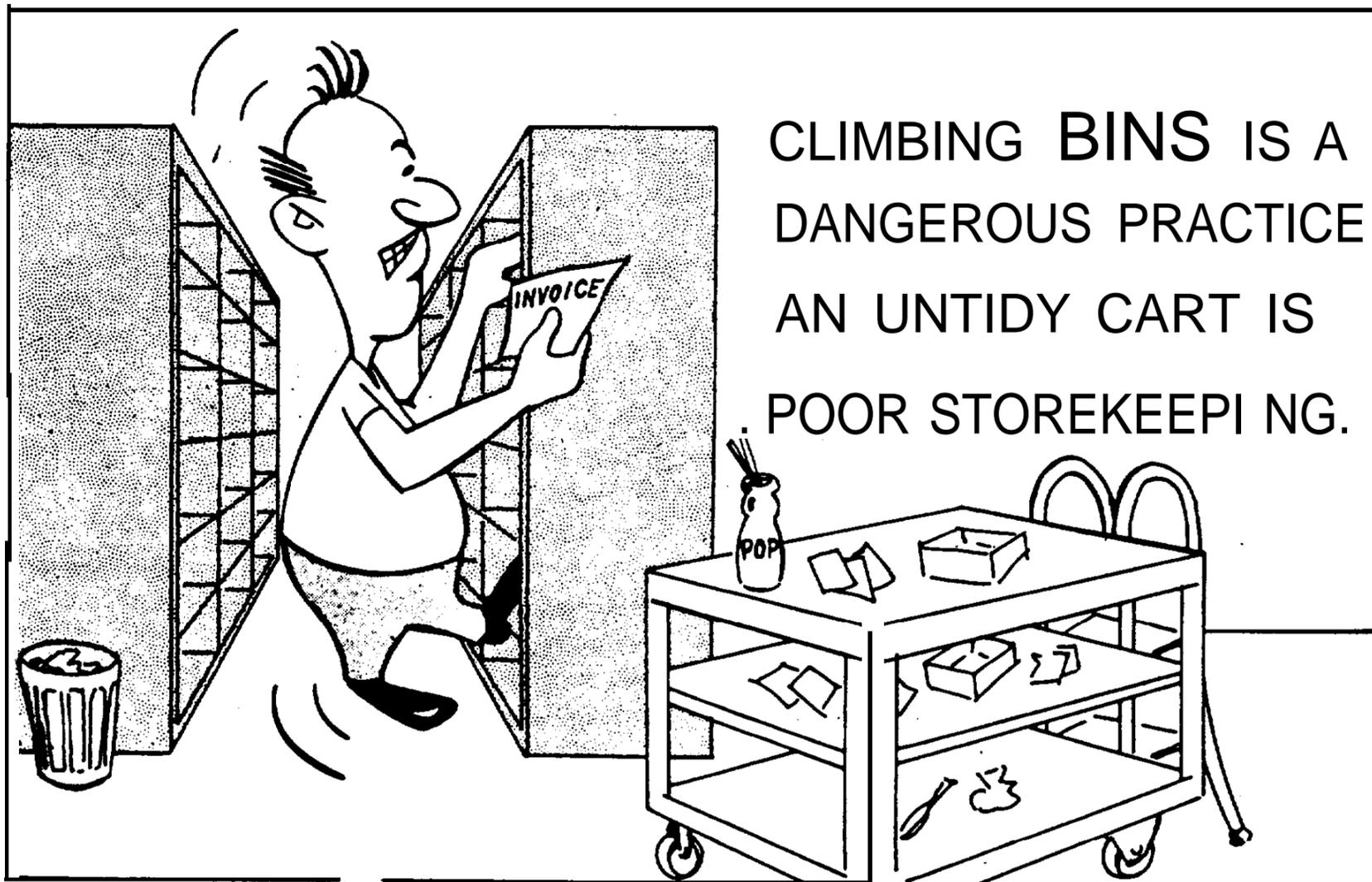


Figure 6-12. Use ladders for climbing. Keep stock picking cart neat.

(e) **Safety rules.** Safety rules will be observed, and **personnel**—

1. Will not reach sidewise more than length of the arm.
2. Will climb down and reposition the ladder.
3. Will position feet **firmly** on the rungs.
4. Will wear appropriate shoes, for protection against slipping.
5. Will clean all grease or oil from shoe soles.
6. **Will not carry** heavy units up or down a **ladder**; forklift trucks will be used to elevate material.
7. Will assure that the bottom brackets of the upper section of extension ladders are properly secured by pins or rungs.

6-114. Manual Handling

a. **Proper lifting method.** Persons who manually handle materials of any type will be instructed in the proper method of lifting heavy objects. The

proper way to lift heavy objects from the floor is for the lifter to stand close to the load, with feet slightly apart and solidly placed. With knees bent, the object will be grasped firmly and lifted by straightening the **legs**, keeping the back as nearly vertical as possible (fig. 6-13). When lifting from an elevated surface, the object will be brought as close to the body as possible to avoid an unbalanced position. With straight back the lifter will keep the load close to the body and will avoid carrying a heavy **load** a long distance without resting. Load will be carried in such a manner that full view is permitted. When lifting with another person, both persons should start and finish the lift **simultaneously** to prevent undue strain on either person. Persons with existing hernias, or those who have a history of previous back strains, will be assigned to duties that do not require heavy lifting. Lifting or lowering operations performed by several persons will be done on signal from one individual, and only after everyone's feet, hands, and other portions of the body are clear. Generally, mechanical means will be used for handling heavy objects.

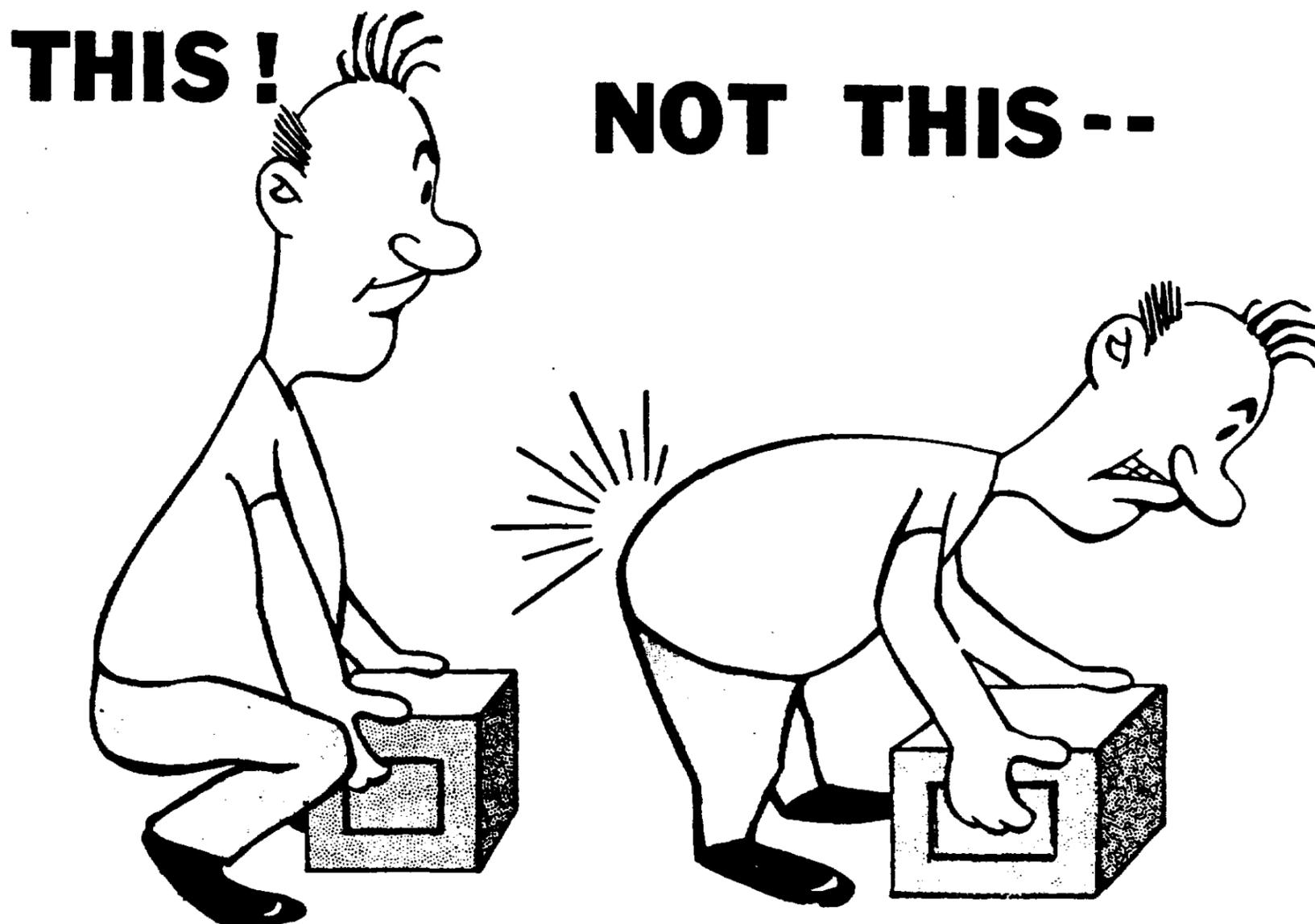


Figure 6-13. Manual lifting and carrying.

b. Precautions for manual handling. Safety precautions which apply to manual handling of materials include the following

(1) Protective clothing or accessories, including gloves, face shields, goggles, and safety shoes will be worn as prescribed in paragraph 6-105.

(2) Finger rings will not be worn.

(3) Material will be examined for sharp edges, protruding points, weakened places of "ropes, or other factors which may cause injury to personnel. These defects should be corrected before **proceeding**."

"(4) **All** stacked cargo and" materials **will** be arranged in an orderly manner for convenient and safe **handling**.

(5) Defective or broken strapping on cargo will be removed, repaired, or replaced. Face shield or goggles and proper gloves will be worn when cutting steel strapping, and personnel **will** stand out of the way of a snapping line of cut strapping.

(6) Drums will be rolled by pushing with the hands, not the feet.

(7) Material will not be thrown from elevated places to the floor or ground. Use suitable lowering equipment.

(8) Wheelbarrows, hand trucks, and other similar devices will not be overloaded. These devices **will** be pushed, not **pulled** except when going up inclines.

(9) Ropes, used for carrying, towing, or for life or scaffold lines which have defects, will be replaced.

(10) Chisels, hammer faces, and pliers which have burred, chipped, or badly worn working surfaces or edges will be replaced to prevent serious **injury** to eyes, hands, or face.

(11) Appropriate tools will be used for each job. For example, nail pullers will be used for opening boxes, strap or wire cutters for cutting metal strapping or wire, and hammers for driving nails.

(12) Plugs will be disconnected when electrical power tools are not in use.

(13) Sharp edge tools will not be carried unshielded in pockets.

(14) Hand operated trucks, dollies, and similar equipment will not be parked in traffic lanes or roadways.

(15) Cylindrical objects will be blocked to prevent rolling.

(16) When working at high elevations a lifeline

and safety belt will be worn if other safeguards are impractical.

(17) Personnel **will** not reach around, over, or under the moving part of any machine.

6-115. Safety in Loading and Unloading Railroad Cars/Trucks and Trailers

a. Railroad cars. (Reference 29 CFR 1910.178)

(1) Opening **doors**. Boxcar doors should be opened with a car door opener to prevent **backstrains** and injuries to personnel. Also, this will prevent material loosened in transit **from** falling and striking personnel.

(2) **Checking contents**. Check contents of railroad cars for unsafe loads before starting to unload. Check empty railroad cars for weak or broken floor boards and have repaired. Lay steel plate in doorway area while loading with materials handling equipment. When unloading cars, steel plate will be used over weak or broken floors.

(3) **Gondola cars**. **When** loading or unloading gondola cars with cranes, **all** persons must be removed from the immediate area before the lift is made. Unless required for rigging purposes, personnel should not be permitted to stand on top of the car while the load is being raised, lowered, or swung into position.

(4) **Hopper bottom** cars. Personnel will not be permitted to work inside hopper bottom cars while material is being unloaded. Personnel will use a hopper car safety wrench to open and close hopper car doors to prevent **backstrains** and injuries from falling materials.

(5) **Bridge plates**. Bridge plates between platforms and boxcars **will** be secured in position, either by being anchored or equipped with devices which will prevent slipping.

(6) **Moving rail** cars. Rail cars will not be pushed or pulled with fork trucks or warehouse tractors (fig. 6-14). Wheel stops or other **recognized** positive protection shall be provided to prevent railroad cars **from** moving during loading or unloading operations. Positive protection shall be provided to prevent railroad cars from being moved while **dockboards** or bridge plates are in position.

b. Trucks/trailers (Reference 29 CFR 1910.178).

(1) **Check flooring**. Check flooring for breaks and weakness before they are driven onto with fork truck.

(2) **Wheel chocks**. Ensure that wheel chocks are



Figure 6-14. Fork truck safety tip (towing freight car).

positioned at the rear wheels of the truck or trailer to prevent them from rolling while being boarded with fork truck.

(3) **Bridge plates.** See paragraph a(5) for rail car loading/unloading.

(4) **Trailer safety jacks.** Safety jacks may be necessary to support a semitrailer to prevent up ending during the loading or unloading when the trailer is not coupled to a tractor.

6-116. Buildings and Physical Equipment

a. **Safety related to stairways (29 CFR 1910.23).** Safety precautions which apply to stairways include the following

(1) Unless steps in stairways are made of wood, the steps will have antislip treads.

(2) Stairways over 88 inches wide will have an auxiliary handrail in center and one on each side; over 44 inches wide but less than 88 inches will have a handrail on each side; or 22 inches to 44 inches wide will have at least one handrail.

(3) Stairway openings will be guarded with railings which measure 42 inches from floor to top of railing.

(4) Stairway handrails will be not less than 30 inches nor more than 34 inches from top of railing to surface of the tread at the face of the riser. Intermediate railings or suitable screening will be provided from top of handrails and guard rails to floor or treads.

(5) Stairways **will** be well lighted and maintained clean, dry, and **free** of slippery substances, **refuse**, or stored material.

(6) Personnel **will** walk, not run, up or down stairways and will use handrail.

b. **Safety concerning doors in warehouses.** Safety precautions which apply to doors include the following

(1) Doors will be opened slowly. When opened suddenly, a door can cause serious injury to **personnel** near to or approaching **from** the opposite side.

(2) Clear vision panels of average eye-level height are desirable in solid doors; especially doors which are used considerably.

(3) Loose doorstops will be kept in a safe place when not **in** use.

(4) Door spring or patented door **closers** will be properly tensioned or adjusted to prevent door closing too rapidly.

(5) Only one person will enter a section of a revolving door.

(6) Door hardware must be kept in good repair.

(7) Safe and vault doors must be closed carefully. Do not lock a vault door nor spin the combination lock until assured that no one is inside.

c. **Safety concerning elevators.**

(1) Passenger. Safety precautions which apply to passenger elevators include the following

(a) Qualified inspectors will inspect passenger elevators quarterly.

(b) Any elevator found defective will be plainly tagged and not used until repaired.

(c) All elevators **will** have signs posted indicating the carrying capacity. The safe capacity for passenger elevators will be expressed in terms of maximum number of passengers to be carried.

(d) Rated capacity of elevators will not be exceeded.

(e) Elevators **will** be operated only by trained operators.

(f) Caution will be exercised by anyone entering or leaving elevators, by watching their step, and by not boarding or debarking while elevator is in motion.

(g) passengers **will** not be permitted in an elevator unless it is specifically authorized as a passenger-carrying elevator.

(h) An elevator which is not authorized for passengers will be posted to that effect.

(i) A self-service elevator must be in proper position to board or debark. Do not enter **or** leave until doors are opened fully.

(j) Smoking **will** not be permitted in any **elevator**. Signs to that effect will be posted.

(2) **Elevator operators.** Safety precautions which

apply to elevator operators include the following

(a) Operators will not converse with passengers except for business reasons.

(b) Operator will not eat or read while on duty.

(c) Operator will keep clear of shaft way.

(d) Operator will assure that shaft way doors or gates are closed and locked before car starts and that car gates are closed while running.

(e) Operator will keep passengers away from open edge of platform if car gates are not provided.

(f) Operator will assure that car has completely stopped at the landing level before doors and gates are opened.

(g) When an elevator is taken off duty or service is suspended during normal working hours, a sign stating "Car not working" will be displayed.

(h) If car will not start it may be overloaded, in which instance operator will remove the load. If elevator still will not move the person in charge will be notified.

(i) If car will not stop, operator will not attempt to jump off.

(j) If car stops suddenly between floors operator will call for the person in charge and operate car only at his/her direction.

(3) **Freight elevators.** Freight elevators which are not authorized to carry passengers will be marked to that effect. Freight elevators will be inspected semiannually by **qualified** inspectors. The safe capacity of freight elevators will be expressed in pounds. Operator will assure that the locking device and hoisting attachments are in place before any heavy, concentrated load (such as a safe) is moved on or off the platform. The operator will not raise the car more than a few inches at a time until the locking device has been withdrawn. Safes or other heavy objects, near the capacity of the elevator in weight, will be loaded in center of car and extreme caution will be exercised. Only the operator will be allowed in the car during such procedure.

(4) **Adjustable platform ramps.** Where adjustable ramps (either power or mechanically operated) are installed in loading and unloading platforms, such ramps will be equipped with a safety device which can securely lock the ramp in a **fixed** position. The safety device so used will be of such design that the load capacity of the ramp when in the locked position will be sufficient to support the **specified** capacity of the ramp or platform. Such ramps or

platforms will be periodically inspected by competent personnel.

6-117. Flammable Materials

a. General.

(1) **Classification.** (See chap. V, Sec. 4.)

(2) **Storage in fire resistant buildings.** All safety precautions and procedures will be in accordance with the publications of the appropriate military department. Materials having a flash point between 100° F and 200° F (excluding drummed petroleum products in larger amounts than those stored as station supplies) are best protected when placed in a special **fire** resistant building with additional firefighting equipment and fire walls.

(3) **Storage in general warehouses.** Rules applicable for storage in general warehouses are as follows:

(a) Use end bays when possible.

(b) Handle containers carefully to avoid breakage.

(c) Remove and destroy leaky containers.

(d) Maintain accessibility to stack interior for fire fighting purposes.

(e) Assure that proper ventilation is maintained for materials which give off flammable vapors.

(f) Avoid any location where spilled liquids may come in contact with sparks or flames.

(g) Use spark enclosed electric materials handling equipment.

(h) Consult catalogs of appropriate military departments or directives, as necessary, for items of high flash point or items which are **fire** hazards.

(i) Post "No Smoking" signs and strictly enforce no smoking regulations.

b. Flammable liquids with low flash point (below 100° F).

(1) **Types.** Flammable liquids with low flash point (below 100° F.) include-

(a) Gasoline and other petroleum products including **xylene**.

(b) Certain solvents, including benzene or **benzol** and other **solvent** cleaners.

(c) Certain chemicals.

(d) **Diluents.**

(e) Stencil paints, marking inks, and printers ink.

(f) Certain thinners, primers, compounds, varnishes, lacquers, liquid cement, and wax, acetone, alcohol, ether and naphtha. These materials

will be stored in fireproof buildings or in open sheds.

(2) *Safety precautions if stored in standard flammable storage buildings.* Safety precautions when materials are stored in standard flammable storage buildings are as follows:

(a) **Sections** of the buildings will be separated by fire walls.

(b) All doors and windows that will assist ventilation will be kept open during work operations therein.

(c) Unauthorized persons will not be granted **admittance**

(d) Any noticeable odor of an unusual nature must be investigated at once.

(e) Combustible gas indicator of proper type must be used where gases or flammable materials are stored when spills, leaks, or vapors occur, to determine if the area is safe for workmen.

(f) Suitable **firefighting** equipment must be available and in working condition.

(g) **Spark inclosed** materials handling equipment only will be used for handling purposes where powered equipment is required.

(h) Only explosionproof switches, motors, relays, and electric lights are to be used. Fluorescent lights, unless approved for Class I, Group D locations, will not be used in buildings or areas where flammable materials are stored. In the vicinity of gasoline and gases, portable lights of all

kinds, including flashlights, will be explosionproof. In areas in the vicinity of fluid oils such lights will be vaporproof.

(i) "No Smoking" rules must be enforced within and in the immediate vicinity of flammable buildings. "No Smoking" signs will be posted within and on the outside of the buildings.

(j) Containers will be handled carefully in such buildings.

(k) Leaky containers will be removed and repaired or destroyed.

(l) Oxygen gas will be stored in separate rooms from other compressed **gases** and other highly flammable material (fig. 6-15).

(m) Certain compressed gases in cylinders such as acetylene, chlorine, sulfur dioxide, and **liquified** petroleum or fuel gases (excluding ammonia) **will** be stored upright to prevent damage to valves and to prevent danger when gas is used.

(n) Valves on all cylinders containing compressed gases will be closed tightly. Cylinders on which valves cannot be closed to prevent leaking of gas will be removed to outside storage and tagged for subsequent repair (see A-F, fig. 6-16, for additional precautions).

(o) Cylinders, valves, regulators, and filters on cylinders of oxygen gas will be kept free from oil and grease; never lubricate (C, fig. 6-16).

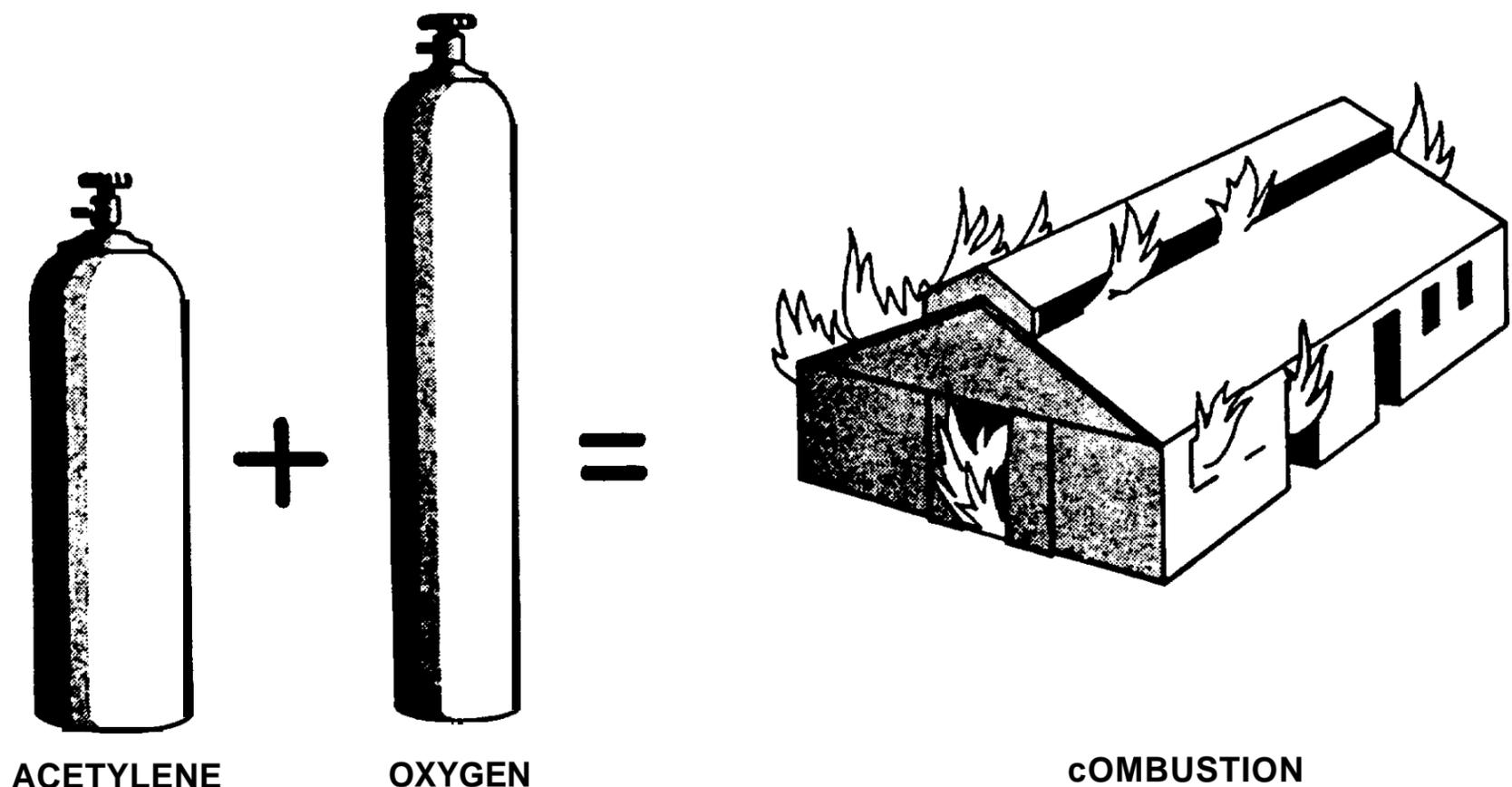


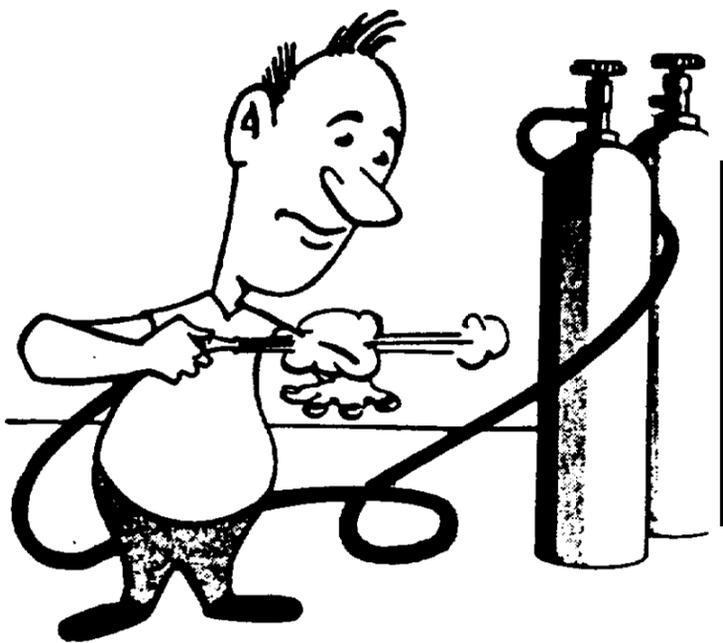
Figure 6-15. Oxygen gas should be separated from other gases.



A. Thaw out frozen cylinder valves in a warm --



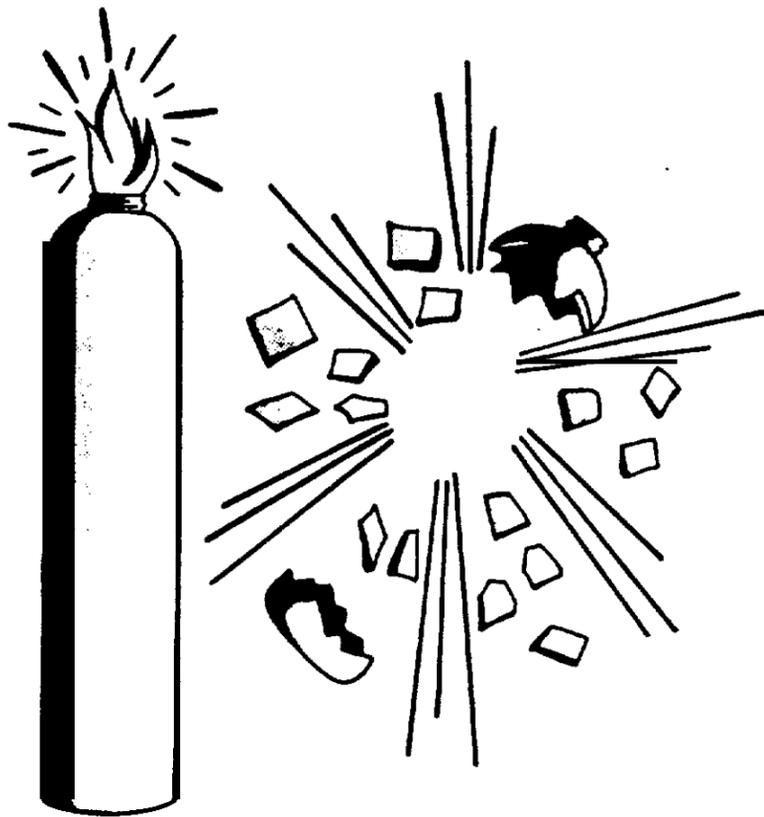
D. Guard against looking valves on gas cylinders.



B. Never use oxygen as substitute for compressed air.



C. Do not oil or grease cylinder valves or regulators.



E. Store oxygen gas separately from a combustible gas or flammable material.

Figure 6-16. Cylinders.

(p) Self-closing metal receptacles will be provided for all discarded oily waste, rags, or mechanics clothing.

(q) Never use oxygen, compressed air, or any other **compressed** gas for blowing dust off the body or clothes.

c. Drummed petroleum products.

(1) *Description.* For description of the characteristics of drummed petroleum products see **MIL-HDBK-201**.

(2) *Precautions.*

(a) *Spark inclosed electric equipment.* Spark inclosed electric materials handling equipment will be used for handling aviation and automotive gasoline. MHE used for this purpose will conform to criteria in 29 CFR 1910.178.

(b) *Gasoline-powered equipment.* Gasoline-powered equipment when used in handling drummed petroleum products will be equipped with such fire prevention devices as prescribed in paragraph 6-112/(4) and 29 CFR 1910.178.

(c) *All equipment.* Steering columns and electric wiring of powered materials handling equipment will be kept free from excessive grease accumulations.

(d) *Posting of signs.* "No Smoking" signs must be posted and smoking prohibited in or around the area.

d. *Buildings containing flammables.* Buildings or areas containing flammables will be provided with appropriate portable fire extinguishers in adequate quantities placed at strategic locations for emergency action.

e. *Loading of containers.* All containers of flammable gases and liquids will be affixed with appropriate diamond shaped red labels, in accordance with Title 49 CFR, section 173.404 at the time container, cylinder, or drum is **filled** or when labels are missing **from** shipments received.

f. *Other flammable material constituting a fire hazard.*

(1) *Solid flammable materials.* Solid flammable materials such as paper, textiles, rubber hose, gaskets, or other rubber products including rubber packing, rope, oakum, fiber, special lumber, and other nonliquid flammable items will, when possible, be stored in a sprinklered warehouse with adequate fire protection such as the provision of appropriate fire extinguishers in adequate quantities, the provision of fire aisles, where necessary, the installing of "No Smoking" signs in conspicuous



F. Do not expose to open flames of any type.

Figure 6-16. Cylinders-Continued.

places, the strict conformance to no smoking regulations by personnel, proper ventilation, and the use of appropriate types of powered materials handling equipment.

(2) *Liquid flammables.* Liquid flammables such as acids, **flammable** chemicals, preservation liquids of flammable nature, which when subjected to water or flames become fire hazards, will be stored separately in small buildings or areas; or in special containers when required; and as designated herein, on the containers, in special instructions, or in directives.

(3) *Flammable scrap and rubbish.* Flammable scrap materials will be stored in open storage areas. Rubbish will be burned in special outside **areas**, in incinerators, or disposed of otherwise.

g. *Certain fire hazardous materials.* Certain acids, chemicals, and other compounds, although not flammable when sealed or kept in tightly closed containers, constitute a definite hazard when stored near **flammable** materials where the containers could be accidentally broken open or become unsealed; or when stored in small quantities in packing rooms and shops for intermittent use and only opened from time to time. Such materials will be stored in separate small buildings or areas, when practicable. The materials will be isolated when stored in the vicinity of flammable materials. Special care must be taken to reduce possibility of breakage, accidental opening, or careless covering or stoppering of the containers. Many fire hazardous materials must be kept in cool dry places, or in special containers such as glass, or earthenware, or lead. Such materials **include**—

(1) Chromic, nitric, and **sulfuric** acids.

(2) Oxygen gas (store in separate room or compartment).

(3) Calcium carbide (dangerous fire hazard if not kept dry).

(4) DDT insecticide solution.

(5) **Chlordane** liquid insecticide.

(6) Ammonium nitrate (store in isolated spaces or in ammunition depots).

(7) Calcium phosphide (keep cool and dry).

(8) sulfur flour.

(9) **Toluene (toluol)** (handle with care and **maintain** ventilation).

(10) Water-repellent wood preservative compound (store and *use* outdoors or in well ventilated and protected rooms).

h. Flammable packing materials and preservation compounds.

(1) **Care in storage.** Packing materials such as rubber sheeting and strips and barrier material will be accorded the usual safety precautions and will be stored in **sprinklered** warehouses. Preservation compounds such as carton adhesive, composed of reclaimed rubber and naphtha, and wood preservation compounds also will be stored and handled as flammable materials.

(2) Storage *in fire-resistant buildings.* Shredded paper packing and excelsior will be stored in separate ventilated fire-resistant buildings (small size preferable) or in buildings which are not flammable such as buildings having corrugated steel bulkheads and roof.

(3) *Requisition in small quantities.* Shredded paper, excelsior, and flammable preservation compounds should be requisitioned by the packing sections in small quantities and any unused portion of such materials will be stored in small ventilated **fireproof** rooms or **fireproof** closed bins. Sweepings of such materials will be placed in metal receptacles having self-closing lids or covers (fig. 6-17).

i. *Safe storage of metal shavings and metal scrap borings or turnings.* Scrap materials such as metal shavings, borings, or turnings, because of the cutting oils used, the finely divided state, and in the case of some metals such as magnesium, the ready combustibility, are highly flammable. Such scrap metal will be stored outside in bins having three sides and deck made of concrete with the top and front open. The size should be adequate to contain the normal amount of such scrap, usually, approximately 12 feet in width, 12 feet in length, and 10 feet in depth.

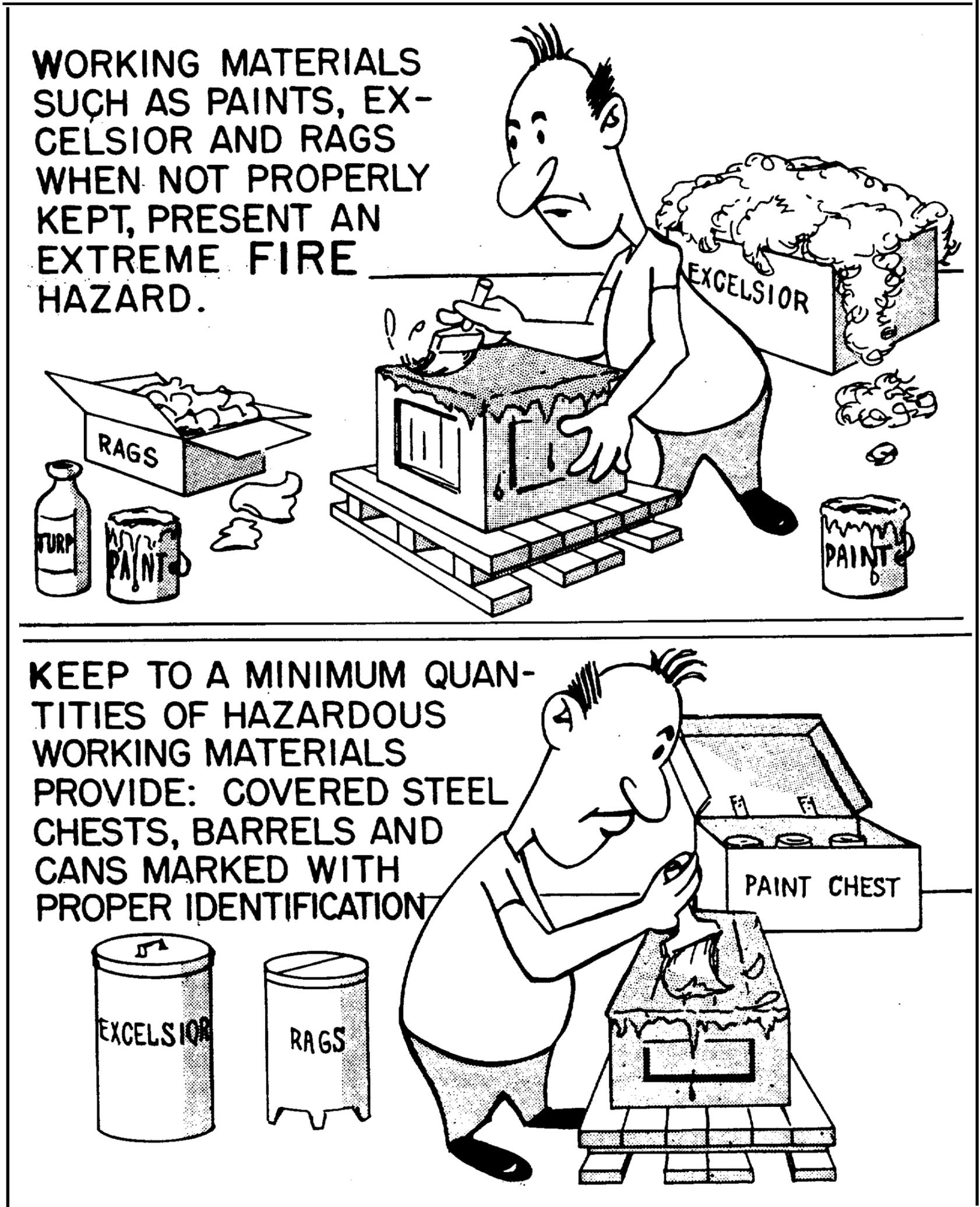


Figure 6-17. Keep packing materials in fireproof or sparkproof receptacles.

j. Safety in handling compressed gases and cylinders. Safety precautions for handling compressed gases and cylinders will be as follows:

- (1) Cylinder valves will be closed before moving cylinder.
- (2) Valve **caps will** not be used for lifting cylinders from one vertical position to another.
- (3) Suitable materials handling equipment will be used for lifting and transporting cylinders.
- (4) Suitable hand trucks should be provided for conveying **cylinders**; cylinders moved on hand truck **must be held securely** in position.
- (5) Cylinders to be transported in **trucks**, rail cars, or ships will be braced securely to avoid overturning or moving.
- (6) When suitable hand trucks are not available, cylinders will be moved by tilting and rolling on the bottom edge. Do not drag or slide the cylinders.
- (7) Cylinders will not be dropped or permitted to strike against each other violently.
- (8) Pipelines and cylinders will be marked in accordance with Military Standard MIL-STD-101.
- (9) Any cylinder of compressed gas which is not definitely identifiable as to contents will not be issued until the content is identified.
- (10) Explosionproof lights only will be used in compressed gas storage areas.
- (11) For safety in cutting and welding, see reference documents of the appropriate military department in the appendix.

6118. Poisonous or toxic and Radioactive Materials

a. Safety precautions. Many liquids, chemicals, and compounds are, in addition to being flammable or dangerous in other ways, poisonous when contacted or inhaled. Therefore, this material requires special care in storing and handling to prevent injury or death to operating personnel. Such materials will be isolated or placed in areas which can be well ventilated, while personnel are working in the area, or stored outside. Care will be taken to prevent breakage or leakage of any kind. Personnel must be protected to preclude excessive inhalation of vapors, contact with skin, or danger to eyes when this material is stored in regular storage or when stored in shops. Personnel working in such areas and with such materials will have proper safety clothing and equipment at all times (**paras** 6105 and 6-121).

b. Highly poisonous or toxic materials. The following are examples:

- (1) *Leaded gasoline.* **G a s o l i n e containing tetraethyllead must** be stored outside. Exposure to its vapors must be kept to a minimum. It is not to be used for cleaning, cooking, and heating except where specified.
- (2) *Sodium monofluoracetate.* Sodium **monofluoracetate** is extremely poisonous to both man and animals and will be kept in locked rooms inaccessible to unauthorized personnel. This chemical must be kept dry and must not be allowed to contaminate food or water.
- (3) *Cuprous cyanide.* Cuprous cyanide must be kept sealed.
- (4) *Other highly poisonous or toxic materials.* Potassium cyanide and sodium cyanide must not be handled without protective gloves.
- (5) Mercuric oxide pigment is also a poisonous substance.

c. Radioactive materials. Radioactive materials will be handled and stored in accordance with DLAM 4145.8/AR700-64/NAVSUP PUB, 5012/AFM 67-8/MCO P4400.105 and 29 CFR 1910.96.

d. Ionizing radiation (29 CFR 1910.96). Ionizing radiation cannot be detected by the human senses. Special instrumentation is required to detect and evaluate radiation hazards. Any damage to radioactive commodities or containers of these materials should be reported to the Radiological Protection Officer.

e. Other toxic materials

- (1) *Acids.* For detailed instructions for storage of acids see paragraph 6121.
- (2) *Certain gases.* Certain compressed gases, such as chlorine and **sulfur** dioxide are very toxic when inhaled.
- (3) *Cleaners, solvents, and preserving materials.* Many cleaners and solvents are hazardous if improperly used. Benzene (**benzol**) and carbon **tetrachloride** will not be used **as** cleaners or solvents. Follow the manufacturer's label and consult the material safety data sheet for procedures and safety precautions.
- (4) *Other categories.* Other categories of poisonous materials are insecticides, **rodenticides**; metal plating chemicals; metal treatment chemicals; reagents; photographic and lithographic chemicals (including formaldehyde solution and duplicating liquid); tetrachloroethane (toxic); **tricresyl** phosphate; **amyl** acetate; and aromatic petroleum naph-

tha (poisons). Certain coatings such as paint thinners, solvents, thinners, diluents, primers and sealers, and rubber paint are toxic. Methyl bromide is a poison.

6-119. Corrosive Materials

a. Corrosive qualities. Certain materials are injurious to personnel because of the corrosive qualities. Care must be taken to prevent any spillage or container breakage which could permit contact to skin, eyes, or inhalation into the lungs of personnel working with such materials.

b. Precautions in handling. Personal protective clothing and equipment designed for the specific exposure will be worn when handling corrosive materials. Approved respiratory devices will be worn when handling caustic materials, e.g. sodium hydroxide (caustic soda).

c. Materials of corrosive nature.

(1) *Acids.* Almost all acids are corrosive in nature. Acids must be kept well sealed or stoppered. Protective gloves will be worn when filling containers or if there is any evidence of leakage at the stopper. A dust mask must be worn by all personnel when handling flakes of chromic acid.

(2) *Caustic soda or sodium hydroxide pellets.* Caustic soda or sodium hydroxide pellets are extremely corrosive and must not be handled without protective gloves or allowed to come into contact with the skin. Containers must be kept well sealed and stoppered.

(3) *Hydrogen peroxide.* Rubber gloves and goggles must be worn when handling hydrogen peroxide. Guard against any contact with skin or eyes.

(4) *Potassium hydroxide.* Containers must be kept sealed tightly.

6120. Certain Other Hazardous Commodities

a. Anhydrous ammonia. Anhydrous ammonia is highly irritant and causes burns to skin. Guard against leakage. Isolate from others, store in a cool place. Store cylinders on side.

b. Water treatment compound (briquette). Water treatment compound positively must be prevented from mixing with any water to be used for drinking purposes.

c. Ammunition, explosives, and ordnance. Ammunition, explosives, and ordnance are handled and stored in accordance with existing regulations and directives for handling and storing such materials.

d. Miscellaneous hazardous commodities. Many

other commodities require special care in storage. Helpful instructions for the handling and storing can be found for many commodities in the "Chemical Safety Data Sheets" (published by the Manufacturing Chemists Association, Inc., 246 Woodward Bldg., 15th & H St. N. W., WASH DC 20005) and "Handbook of Dangerous Materials" (published by Reinhold Publishing Corporation, New York Book Division, 330 W. 42nd St., New York, NY 10836). Activities which require these publications should effect procurement in accordance with procurement regulations of the appropriate departments. Containers of hazardous commodities will be inspected frequently to assure that the containers have not deteriorated sufficiently to cause rejection of shipment in interstate commerce or would be an accident hazard on arrival at destination.

6-121. Safety in Acid Storage

a. Acids in containers. Acid in carboys, drums, and tanks will be handled, transported, and stored in accordance with specific instructions provided for each type of acid in the "Chemical Safety Data Sheets" as described in paragraph 6-120d. Certain other acids (such as oxalic acid) in small bottles, not listed in this publication, will be accorded, in relation to the type of hazard involved, the same care in storage as for acids listed.

b. Isolation of acids. All acids will be stored in isolated inside areas if practicable and, if possible, flammable warehouses. Acids may be stored outside but must be protected from direct rays of the sun in covered sheds or covered with tarps. Acids will be protected against freezing, whether inside or out, to preclude breakage of containers. Hydrochloric acid (see Chemical Safety Data Sheet SD-39) should be stored outside unless an isolated area is available in special buildings. If necessary to prevent freezing, store in heated buildings. Drums will be stored with bungs up. Isolation of acids from materials such as paper, excelsior, sawdust, wood scrap or cellulose, shavings, cloth, textiles, or flammable liquids will be maintained to preclude fire hazards and damage to such materials. Because some acids are explosive when certain gases (such as hydrogen) develop in drums containing the acid, the acid drums will be isolated from drums containing other chemicals, such as hydrogen sulfide, turpentine, carbides, metallic powders, and combustible materials.

c. *Access to water.* Acids, when stored, should be within easy access to large quantities of water under moderate pressure, for emergency action in the event a person has contacted the acid and for flushing purposes to cleanse the areas where spillage has occurred. Provide deluge-type safety showers and eye baths near acid storage and near locations where acids are opened, packed, or handled. Special safety clothing and safety accessories will be provided for personnel handling acids, working in or near tanks, acid storage rooms, or inside tank cars, including gas-tight chemical safety goggles, rubber gloves and aprons, brimmed felt hats or treated fiber hats, and safety shoes. Additional safety apparatus will be provided, including gas masks, breathing apparatus, and other safety aids.

d. *Ventilation.* All rooms and inside areas should be well ventilated or be ventilated thoroughly before allowing personnel to enter. Good ventilation will be maintained constantly while personnel are working in acid storage areas. If leakage, breakage, or spillage of acid occurs, the areas will be well flushed with large quantities of water. Cloths, sawdust, or any other organic material will not be used for swabbing or sweeping areas where spillage has occurred. If water is not immediately available, use clean dry sand, ashes, or gravel to cover the spillage. Smoking will not be allowed in or near acid storage areas. As most acids give off highly corrosive vapors, electrical wiring in buildings will be of vapor proof type and should be in tight, rigid metal conduit. Because of the corrosive action of the vapors, acids will be stored away from metal material which could be damaged.

e. *Explosionproof lights and switches.* Because of possible explosion, especially in nitric acid, spark and explosionproof lights and switches will be used on electrical equipment and wiring in storage or in and around tanks or tank cars. Fluorescent lights, unless approved for Class 1, Group D locations of National Fire Code (NFPA) will not be used.

f. *Venting of drums.* Drums of acid in storage will be vented weekly or more often in hot weather to release the pressures that may have built up. Extreme caution will be practiced when plugs in drums are being loosened; a long-handled pipe or plug wrench will be used. Personnel will face away from the plug and turn the plug only one turn until the pressure has equalized to atmospheric pressure. Drums will be handled carefully, especially in warm weather, to prevent bumping sharply against each

other. Tools must not be permitted to strike the drums or plugs sharply and cause sparking. Open or naked flames must not be permitted to contact drums or tanks. Sulfuric acid storage must be especially well ventilated to prevent vapor accumulation.

g. *Mixing with water.* Never add water or caustic solutions to sulfuric acid as violent reactions may occur. If it is necessary to mix acid and water, always add the acid cautiously to the water; never add water to strong acid.

h. *Inspection of containers.* Upon receipt, inspect all carboys and drums of acid carefully for possible leakers. Set aside leakers or damaged containers for special handling. Do not walk a carboy on the edges of its box, use trailers or specially designed hand trucks. Do not handle carboys by the neck. Never attempt to remove carboy stopper wire by twisting or prying use wire cutter. Be sure closures on filled or empty carboys are fastened securely before moving. Unwashed empty carboys must be handled as carefully as filled containers.

6-122. Petroleum Products—Safety Precautions

a. *Petroleum products having a flash point in excess of 100° F.* Petroleum products having a flash point in excess of 100° F include: diesel fuel oils, lubrication oils, kerosene, naphtha cleaners, and paint and varnish thinners. As petroleum products are dangerous when the temperature is raised to the flash point, extreme caution must be observed as to smoking, firefighting equipment, leakage, and vapors.

b. *Gasoline and JP-4 jet fuels.* Gasoline and JP-4 jet fuels have a normal flash point of a -75° F or a Reid Vapor Pressure of less than 14 pounds per square inch. Careless handling and storing of gasoline is extremely hazardous because all gasolines give off flammable vapors at any temperature, even in subzero weather; and gasoline vapors are heavier than air and consequently will seek low areas and follow air currents to great distances from source. This means that West danger exists in wide areas where leakage occurs, (For special precautions concerning JP-4, see MIL-HDBK-201.)

c. *Gasoline storage safety precautions.* Safety precaution rules for the storage of gasoline will be as follows:

(1) Smoking will not be allowed in the vicinity of gasoline storage, storage tanks, gasoline pump houses, loading racks, truck storage, or other dan-

ger areas. Personnel will not carry "strike anywhere" matches or mechanical lighters in a danger zone.

(2) Leaks from tanks, pipe lines, pumps, and at loading racks must be prevented.

(3) Personnel handling and storing gasoline must be familiar with the hazardous characteristics of gasoline.

(4) When gasoline has been spilled, all sources of ignition must be eliminated from the surrounding area until such time as air currents have dissipated the gasoline vapors.

(5) Persons working where gasoline vapors may be present must not wear shoes that have metal plates, hob nails, or other exposed nails, which may produce sparks.

(6) Only explosionproof switches, motors, relays, electric lights, and portable lights (including flashlights) will be used where gasoline vapors may be present. Fluorescent lights will not be used unless approved for Class 1, Group D locations of National Fire Code (NFPA).

(7) Gasoline must not be transferred from one container to another unless the containers are connected securely with an electric bonding cable. The bonding cable equalizes the static electricity charge of the containers and eliminates the possibility of a spark of static electricity which may ignite gasoline vapors.

(8) Gasoline must not be used to clean floors, automotive parts, clothing, or similar items. Products with a higher flashpoint should be used for this purpose such as stoddard solvent.

(9) Fire-extinguishing equipment (foam or carbon dioxide, not water) must be provided in adequate quantities. All personnel must know the location and how to operate the extinguishers.

(10) Self-closing metal receptacles will be provided for all discarded oily waste, rags, or mechanics' clothing.

d. Other liquified fuels. Butane and propane have normal flash points of -75° F or a Reid Vapor Pressure in excess of 14 pounds per square inch. The fuels are shipped by bulk or in tanks. The following special precautions must be observed to handle these products safely:

(1) In the event of leaks, work procedures will guard against danger of explosion or fire.

(2) Acute fire hazards and open flames will be kept away from areas in which these materials are stored.

(3) Only explosionproof portable and permanent lights will be used in the storing areas.

(4) When handling these liquids, eyes must be protected carefully.

e. Gasoline vapors. Gasoline vapors, even in concentrations of less than 1 percent, will cause nausea and headache if inhaled for any length of time. Inhalation of high concentrations may cause unconsciousness or death.

f. Tetraethyllead. Most gasoline contains tetraethyllead to increase the octane rating. Tetraethyllead is absorbed through the intact human skin and, therefore, should not come in contact with any portion of the human body.

g. Empty drums previously used for flammable liquids.

(1) *Precautions for storage.* Empty drums which have contained highly flammable liquids and which have not been thoroughly cleaned will not be stored inside a building. Uncleaned empty drums are more hazardous than filled drums.

(2) *Affixing labels.* All drums that formerly contained flammable liquids, but which have not been purged to remove explosive vapors, will have affixed to the head a red diamond-shaped label as specified in Title 49 CFR Section 173.409.

(3) *Drums not to be used for other substances.* Substances, other than gasoline or preservative, will not be placed in a drum or barrel formerly containing gasoline unless the drum or barrel has been reconditioned. Containers unfit for storage of gasoline will not be transferred from one activity to another except for the express purpose of cleaning or repairing and then only after approval by the appropriate military department.

6-123. Safety Precautions for Solid Fuels in Storage

a. General. When exposed to the air, some solid fuels, such as coal, are subject to oxidation which is similar to combustion or burning, but is much slower and is unaccompanied by flame. The oxidizing process generates heat and, if uncontrolled, results in spontaneous combustion. Because of different characteristics, some coals ignite spontaneously more quickly than others.

b. Storage area. The storage area should be from, not covered with planking or porous material such as gravel and cinders; should be well drained; should be free from steam pipes or other outside sources

of heat; and must be free of oily waste, wood, or other flammable material.

c. Spontaneous combustion in solid fuel.

(1) Cause. Large pieces of coal tend to become separated from the fine coal and dust. In ordinary dumping the ~~fine~~ coal rolls to the edges and sides of the pit, and as the coal is used, the fine coal forms a core, surrounded at the bottom and the outside edges by coarse coal. Between the fine and the coarse masses of coal there is a zone of mixed fine and coarse coal gradually **varying** in proportions. **In this zone the air will** trickle and cause oxidation but will not escape **fast** enough to carry away the heat generated, resulting in spontaneous combustion. Usually, such hot spots are 3 to 8 feet below the surface of the pile.

(2) *Prevention.* The danger of combustion can be minimized by mixing the fine and coarse sizes of coal evenly through the pile so that the lumps are well buried in the fine coal and thus exclude air. This is done by spreading the coal in comparatively thin layers (approx 2 feet thick) and packing each layer with a bulldozer.

(3) *Combating heat.* Coal piles will be inspected frequently and if the temperature reaches 180° F or above, or if the coal has already fired, the contents of the pile will be used or moved. Water can penetrate only a few feet into a coal pile and is ineffective in reducing the temperature. Pipes, with a thermometer lowered in each pipe to take a reading of the temperature, should be inserted in the pile extending from a point near the bottom to 3 feet above the top.

6-124. Lumber Yard-Fire Precautions

Water supply will be accessible and adequate for

all emergencies. Fire hydrants and appropriate fire extinguishers will be provided at strategic locations. Smoking will be prohibited in and near the yard and "No Smoking" signs will be posed conspicuously at strategic locations.

6-125. Strategic and Critical Material

a. General. Certain commodities are categorized as national stockpile material from time to time as dictated by availability conditions in relation to potential national emergencies. Some materials so segregated require special consideration for safety while in storage. So far as is consistent with the provisions of this regulation such material will be handled and stored in accordance with the Strategic and Critical Materials Storage Manual published by General Services Administration (GSA) and available through the individual departments. Safety precautions as directed in this **regulation** will be followed. Proposed deviations in methods to be employed in the storage of national stockpile material or required clarification concerning safe storage will be referred to the appropriate military department.

b. Fire protection. Generally, the normal fire prevention and protection measures established at military activities, and as herein covered, are considered adequate for national stockpile material. However, when special precautions are outlined in the specifications furnished in connection with the storage of material of a combustible or flammable nature, additional fire prevention and protection measures in accordance therewith will be **established**. When such measures result in additional costs, prior approval of the appropriate military department must be obtained.