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AGENDA

Hour 1 Emergency / Fire Safety Plans

Hour 2 Storage and Handling Flammable Liquids & Spray Booths

Hour 3 Walking Working Surfaces

OBJECTIVES

You will learn:

· Emergency / Fire safety plans l;
· Storage and handling flammable liquids & spray booths;
· Walking working surfaces.

INTERNET WEB SITES
FOR
OCCUPATIONAL SAFETY & HEALTH INFORMATION
April 2005

GENERAL

NATIONAL SAFETY COUNCIL (NSC)
http://www.nsc.org/

The NSC has a user friendly web site for innovative and current information on home, farm and community, on the road and workplace safety and as well statistical data and charts.

NORTH DAKOTA WORKFORCE SAFETY & INSURANCE
http://www.workforcesafety.com/

For workplace safety, North Dakota's WSI site puts forth their "safe operating procedures" page where they give information on accident and near miss reports, substance abuse, material handling and storage, walking and working surfaces, and safety program development and orientation.

OCCUPATIONAL & INDUSTRIAL SAFETY RESOURCES
http://www.khake.com/page59.html

Maintained by a Vocational Information Center, this web site provides links to occupational and industrial safety with lists of directories, national centers, hotlines and help lines as well as specific area coverage such as emergency, disaster and natural hazards, and tool, machine and equipment safety options.

OKLAHOMA STATE UNIVERSITY
http://www.pp.okstate.edu/ehs/

The Department of Environmental Health & Safety at OSU offers an online safety resource library that is constantly being updated with topics from A-Z including specific areas of safety such as fire, construction, HAZCOM and training. Go to the "Links Library" option.

SAFETY DIRECTORY
http://www.safetydirectory.com/

Safety Directory.com is an Internet gateway to occupational health & safety sites. This web site is indexed with information on industry specific topics, training, illness and injury, as well as safety publications and resources.

FEDERAL GOVERNMENT

CENTERS FOR DISEASE CONTROL & PREVENTION (CDC)
http://www.cdc.gov/

The CDC is always a good resource for current medical issues throughout the United States. Health topics from A-Z give an in-depth look at most communicable diseases as well as topics such as safe driving, violence, and air pollution, and workplace safety and health topics.

FEDERAL EMERGENCY MANAGEMENT ASSOCIATION (FEMA)
http://www.fema.gov/

For up-to-date information on active disasters and emergencies nationwide access this web site first. Publications include options for emergency preparedness and prevention, response and recovery, disaster fact sheets, and public awareness information.

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY & HEALTH (NIOSH)
http://www.cdc.gov/niosh/homepage.html

NIOSH's web site provides current information on many services as well as safety research, including ergonomics programs, respirators, and mining safety. At the chemical page you will find databases and other helpful resources, information on personal protective equipment, as well as government agency web sites of interest.

OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION (OSHA)
http://www.osha.gov

OSHA'S official web site includes media releases, online publications, statistics, standards & directives, "Technical Links," training center courses, "hot topics," and "what's new" as well a very useful A-Z index page.

INTERNATIONAL RESOURCES

HEALTH & SAFETY EXECUTIVE (HSE)
http://www.hse.gov.uk/

The United Kingdom has an international safety web site with a good deal to offer on occupational safety & health. Drop down boxes offer A-Z industry information, health and safety topics, tools, research, as well as publications and statistics.

ERGNET
http://www.sunderland.ac.uk/~ts0gli/ergnet.htm

The University of Sunderland in the UK is an international web site directory of "places for ergonomics and human factors". Featuring lists of sources such as societies, organizations, government bodies, institutes, centers and laboratories, this site also gives links to journals, a research database and other general ergonomic sites.

OHIO

OHIO EPA (OEPA)

http://www.epa.state.oh.us

At the official web site for Ohio's Environmental Protection Agency; use the "Topic Index" to find regulations and information on permits, hazardous waste, pollution prevention, wastewater, wetlands, and much more.

OHIO STATE LIBRARY/OHIOLINK
http://winslo.state.oh.us

At **OhioLink**, a statewide library and information network, you can search the State Library of Ohio's collection for the BWC's Division of Safety & Hygiene library books as well as other Ohio College and university library collections. Also available at this web site are searchable versions of Ohio Administrative laws and rules, electronic databases, and other Ohio library directories.

SPECIFIC (BY SUBJECT)

CONSTRUCTION
http://www.cdc.gov/elcosh/index.html

CDC's **eLCOSH** is a comprehensive library of construction-related safety information presented in both English and Spanish with items listed under trade, hazard, job site, and others. Also see: The Construction Industry Safety Council, a Center to Protect Workers' Rights resource center at ***http://www.buildsafe.org/RSC.htm*** for OSHA publications in PDF and hazard alerts.

ERGONOMICS
http://www.ergoweb.com

ERGOWEB provides current information on ergonomics and human factor science. Offered are: research, case studies, reference material and a forum for questions, answers and discussion.

LABORATORY SAFETY
http://safety.science.tamu.edu/

Texas A&M University College of Science is an optional choice for safety in the laboratory information. From hazard identification to waste disposal this web site offers thorough coverage of laboratory safe practices.

MATERIAL SAFETY SHEETS
http://www.ilpi.com/msds/index.html

This web site offers many solutions for finding MSDS (100 free sites) as well as chemical manufacturers and suppliers, pesticides including fertilizers, government sites, and other miscellaneous locations for chemical data. Also check any toxicological effects at *http://www.atsdr.cdc.gov/toxprofiles/* and health and safety information on household chemical ingredients at *http://householdproducts.nlm.nih.gov/*.

MOTOR CARRIER SAFETY PROGRAMS

http://www.fmcsa.dot.gov/safetyprogs/saftprogs.htm

The Federal Motor Carrier Safety Administration (FMCSA), an administration within the U.S. Department of Transportation, regulates and supports the Nation's interstate commercial carrier industry. The FMCSA web page offers several safety programs in PDF format such as brake safety, fatigue, HAZMAT safety, speed management, sharing the road safely, and other insurance and licensing information.

RADIATION
http://www.physics.isu.edu/radinf/

The Radiation Information Network offers a web site that is in-depth with information on radiation topics and issues. In addition to what's new in the field and general information there are regulatory, organizational and society links as well as research and educational resources available to access.

SAFETY STATISTICS
http://stats.bls.gov/

Occupational health and safety statistics by industry and occupation can be researched for injuries, illnesses, and fatality data at this web site starting with the "Overview of BLS Statistics on Worker Safety and Health" page.

SAFETY BRIEFINGS, MANUALS, PRODUCTS & PROGRAMS

OSHA POWERPOINT SAFETY PRESENTATIONS
http://esf.uvm.edu/sirippt/powerpt.html

An extensive safety PowerPoint presentation library is available at this web site featuring A-Z topics such as accident investigations, bomb threats, chemical spills, construction, electrical, hand tools, emergency response, fire safety, forklifts, JSA, laser, OSHA compliance, PPE, razor knife safety, safe lifting, and many more.

SAFETY PUBLICATIONS & VIDEO RESOURCES
http://www.cbs.state.or.us/external/osha/standards/pub.htm

A valuable resource for safety resources, the Oregon State's Department of Consumer and Business Publications web site is packed with downloadable information. Areas covered are agriculture, asbestos abatement, occupational exposures, HAZCOM, HAZMAT, HAZWOPER, safety practices, writing manuals and programs, tools of the trade, workers' compensation and ergonomics.

Ohio Bureau of Workers' Compensation, Div. of Safety & Hygiene Library
30 W. Spring St., L-3, Columbus, OH 43215-2256
(800) 644-6292, press option 2 - 2
(614) 466-7388/ (614) 644-9634 (fax)
E-Mail: library@bwc.state.oh.us

Saving You Time and Research

Requests for copies of OSHA standards, information on starting a safety committee, a video on accident investigation techniques -- these are some of the thousands of inquiries BWC's Division of Safety & Hygiene (DSH) libraries receive each year.

DSH has two libraries to serve you:

- The central library in the William Green Building in downtown Columbus;
- The resource center and video library located at the Ohio Center for Occupational Safety and Health (OCOSH) in Pickerington.

Both libraries are open 8 a.m. to 4:45 p.m., Monday through Friday. Your need for information does not require a visit to the library. You can phone, fax, or e-mail your requests and receive a quick response.

The central library provides free information services on the topics of occupational safety and health, workers' compensation and rehabilitation.

The OCOSH resource center provides similar services for those who visit OCOSH for meetings and training center classes.

The video library offers an extensive collection of videotapes to supplement your organization's safety and health training program. It is a convenient and popular source for Ohio employers to borrow quality occupational safety- and health-related training aids.

Visit our Web site at **www.ohiobwc.com.**

Central library
30 W. Spring St., Third Floor
Columbus OH 43215-2256
1-800-OHIOBWC
(614) 466-7388
(614) 644-9634 (fax)
library@bwc.state.oh.us

OCOSH resource center
13430 Yarmouth Drive
Pickerington OH 43147
1-800-OHIOBWC
Resource center (614) 728-6464
Video library (614) 644-0018

EMERGENCY PREPAREDNESS AND RESPONSE

Reference:
29 CFR 1910.38, *Employee Emergency Plans and Fire Protection Plans*

Additional Sources of Information:
Emergency Response (OSHA Web Page)

Discussion/Overheads - 1.97 MB

Student Handouts - 64 KB

EMERGENCY PREPAREDNESS AND RESPONSE

INTRODUCTION

The importance of an effective workplace safety and health program cannot be overemphasized. There are many benefits from such a program including increased productivity, improved employee morale, reduced absenteeism and illness, and reduced workers' compensation rates; however, incidents still occur in spite of efforts to prevent them. Therefore, proper planning for emergencies is necessary to minimize employee injury and property damage.

PURPOSE

This discussion details the basic steps to handle emergencies in the workplace. These emergencies include accidental releases of toxic gases, chemical spills, fires, explosions, and bodily harm and trauma caused by workplace violence. This discussion is intended to assist small businesses that do not have safety and health professionals. It is not intended as an all inclusive safety program but rather to provide guidelines for planning for emergencies.

PLANNING

The effectiveness of response during emergencies depends on the amount of planning and training performed. Management must show its support for plant safety programs and the importance of emergency planning. If management is not interested in employee protection and in minimizing property loss, little can be done to promote a safe workplace. It is therefore management's responsibility to see that a program is instituted and that it is frequently reviewed and updated. The input and support of all employees must be obtained to ensure an effective program. The emergency response plan should be developed locally and should be comprehensive enough to deal with all types of emergencies specific to that site. When emergency action plans are required by a particular OSHA standard, the plan must be in writing; except for firms with 10 or fewer employees, the plan may be communicated orally to employees. The plan must include, as a minimum, the following elements:

(1) Emergency escape procedures and emergency escape route assignments,

(2) Procedures to be followed by employees who remain to perform (or

shut down) critical plant operations before the plant is evacuated,

(3) Procedures to account for all employees after emergency evacuation has been completed,

(4) Rescue and medical duties for those employees who are to perform them,

(5) The preferred means for reporting fires and other emergencies, and

(6) Names or regular job titles of persons or departments to be contacted for further information or explanation of duties under the plan.

The emergency action plan should address all potential emergencies that can be expected in the workplace. Therefore, it will be necessary to perform a hazard assessment to determine toxic materials in the workplace, hazards, and potentially dangerous conditions. For information on chemicals, the manufacturer or supplier can be contacted to obtain Material Safety Data Sheets. These forms describe the hazards that a chemical may present, list precautions to take when handling, storing, or using the substance, and outline emergency and first-aid procedures.

The employer must list in detail the procedures to be taken by those employees who must remain behind to care for essential plant operations until their evacuation becomes absolutely necessary. This may include monitoring plant power supplies, water supplies, and other essential services that cannot be shut down for every emergency alarm, and use of fire extinguishers.

For emergency evacuation, the use of floor plans or workplace maps that clearly show the emergency escape routes and safe or refuge areas should be included in the plan. All employees must be told what actions they are to take in emergency situations that may occur in the workplace, such as a designated meeting location after evacuation.

This plan must be reviewed with employees initially when the plan is developed, whenever the employees' responsibilities under the plan change, and whenever the plan is changed. A copy should be kept where employees can refer to it at convenient times. In fact, to go a step further, the employer could provide the employees with a copy of the plan, particularly all new employees.

CHAIN OF COMMAND

A chain of command should be established to minimize confusion so that employees will have no doubt about who has authority for making decisions. Responsible individuals should be selected to coordinate the work of the emergency response team. In larger organizations, there may be a plant coordinator in charge of plant-wide operations, public relations, and ensuring that outside aid is called in. Because of the importance of these functions, adequate backup must be arranged so that trained personnel are always available. The duties of the Emergency Response Team Coordinator should include the following:

(1) Assessing the situation and determining whether an emergency exists that requires activating the emergency procedures,

(2) Directing all efforts in the area including evacuating personnel,

(3) Ensuring that outside emergency services such as medical aid and local fire departments are called in when necessary, and

(4) Directing the shutdown of plant operations when necessary.

COMMUNICATIONS

During a major emergency involving a fire or explosion it may be necessary to evacuate offices in addition to manufacturing areas. Also, normal services, such as electricity, water, and telephones, may be nonexistent. Under these conditions, it may be necessary to have an alternate area to which employees can report or that can act as a focal point for incoming and outgoing calls. Since time is an essential element for adequate response, the person designated as being in charge should make this the alternate headquarters so that he/she can be easily reached.

Emergency communications equipment such as amateur radio systems, public address systems, or portable radio units should be present for notifying employees of the emergency and for contacting local authorities, such as law enforcement officials, private sector charitable groups, and the fire department.

A method of communication also is needed to alert employees to the evacuation or to take other action as required in the plan. Alarms must be audible or seen by all people in the plant and have an auxiliary power supply in the event electricity is affected. The alarm must be distinctive

and recognizable as a signal to evacuate the work area or perform actions designated under the emergency action plan. The employer must explain to each employee the means for reporting emergencies, such as manual pull box alarms, public address systems, or telephones. Emergency phone numbers should be posted on or near telephones, on employees' notice boards, or in other conspicuous locations. The warning plan should be in writing and management must be sure each employee knows what it means and what action is to be taken.

It may be necessary to notify other key personnel such as the plant manager or physician during off-duty hours. An updated written list of key personnel should be kept listed in order of priority.

ACCOUNTING FOR PERSONNEL

Management will need to know when all personnel have been accounted for. This can be difficult during shift changes or if contractors are on site. A responsible person in the control center must be appointed to account for personnel and to inform police or Emergency Response Team members of those persons believed missing.

EMERGENCY RESPONSE TEAMS

Emergency Response Teams are the first line of defense in emergencies. Before assigning personnel to these teams, the employer must assure that employees are physically capable of performing the duties that may be assigned to them. Depending on the size of the plant there may be one or several teams trained in the following areas:

(1) Use of various types of fire extinguishers,

(2) First aid, including cardiopulmonary resuscitation (CPR),

(3) Shutdown procedures,

(4) Evacuation procedures,

(5) Chemical spill control procedures,

(6) Use of self-contained breathing apparatus (SCBA),

(7) Search and emergency rescue procedures,

(8) Incipient and advanced stage firefighting, and

(9) Trauma counseling.

The type and extent of the emergency will depend on the plant operations and the response will vary according to the type of process, the material handled, the number of employees, and the availability of outside resources. OSHA's Hazard Communication Standard (29 CFR part 1910.1200) is designed to ensure that the hazards of all chemicals produced or imported are evaluated and that information concerning their hazards is transmitted to employers and employees. This is done by means of comprehensive hazard communication programs including container labeling and other forms of warnings, material safety data sheets, and employee training.

Emergency Response Teams should be trained in the types of possible emergencies and the emergency actions to be performed. They are to be informed about special hazards - such as storage and use of flammable materials, toxic chemicals, radioactive sources, and water-reactive substances-to which they may be exposed during fire and other emergencies. It is important to determine when not to intervene. For example, team members must be able to determine if the fire is too large for them to handle or whether search and emergency rescue procedures should be performed. If there is the possibility of members of the Emergency Response Team receiving fatal or incapacitating injuries, they should wait for professional firefighters or emergency response groups.

TRAINING

Training is important to the effectiveness of an emergency plan. Before implementing an emergency action plan, a sufficient number of persons must be trained to assist in the safe and orderly evacuation of employees. Training for each type of disaster response is necessary so that employees know what actions are required.

In addition to the specialized training for Emergency Response Team members, all employees should be trained in the following:

(1) Evacuation plans,

(2) Alarm systems,

(3) Reporting procedures for personnel,

(4) Shutdown procedures, and

(5) Types of potential emergencies.

These training programs must be provided as follows:

(1) Initially when the plan is developed,

(2) For all new employees,

(3) When new equipment, materials, or processes are introduced,

(4) When procedures have been updated or revised,

(5) When exercises show that employee performance must be improved, and

(6) At least annually.

The emergency control procedures should be written in concise terms and be made available to all personnel. A drill should be held for all personnel, at random intervals at least annually, and an evaluation of performance made immediately by management and employees. When possible, drills should include groups supplying outside services such as fire and police departments. In buildings with several places of employment, the emergency plans should be coordinated with other companies and employees in the building. Finally, the emergency plan should be reviewed periodically and updated to maintain adequate response personnel and program efficiency.

PERSONAL PROTECTION

Effective personal protection is essential for any person who may be exposed to potentially hazardous substances. In emergency situations employees may be exposed to a wide variety of hazardous circumstances, including:

(1) Chemical splashes or contact with toxic materials,

(2) Falling objects and flying particles,

(3) Unknown atmospheres that may contain toxic gases, vapors or mists,

or inadequate oxygen to sustain life,

(4) Fires and electrical hazards, and

(5) Violence in the workplace.

It is extremely important that employees be adequately protected in these situations. Some of the safety equipment that may be used includes:

(1) Safety glasses, goggles, or face shields for eye protection,

(2) Hard hats and safety shoes for head and foot protection,

(3) Proper respirators for breathing protection,

(4) Whole body coverings chemical suits, gloves, hoods, and boots for body protection from chemicals, and

(5) Body protection for abnormal environmental conditions such as extreme temperatures.

The equipment selected must meet the criteria contained in the OSHA standards or described by a nationally recognized standards producing organization. The choice of proper equipment is not a simple matter and consultation should be made with health and safety professionals before making any purchases. Manufacturers and distributors of health and safety products may be able to answer questions if they have enough information about the potential hazards involved.

Professional consultation will most likely be needed in providing adequate respiratory protection. Respiratory protection is necessary for toxic atmospheres of dust, mists, gases, or vapors and for oxygen-deficient atmospheres. There are four basic categories of respirators:

(1) Air-purifying devices (filters, gas masks, and chemical cartridges), which remove contaminants from the air but cannot be used in oxygen-deficient atmospheres.

(2) Air-supplied respirators (hose masks, air line respirators), which should not be used in atmospheres that are immediately dangerous to life or health.

(3) Positive-pressure self-contained breathing apparatus (SCBA), which

are required for unknown atmospheres, oxygen-deficient atmospheres, or atmospheres immediately dangerous to life or health.

(4) Escape masks.

Before assigning or using respiratory equipment the following conditions must be met:

(1) A medical evaluation should be made to determine if the employees are physically able to use the respirator.

(2) Written procedures must be prepared covering safe use and proper care of the equipment, and employees must be trained in these procedures and in the use and maintenance of respirators.

(3) A fit test must be made to determine a proper match between the facepiece of the respirator and the face of the wearer. This testing must be repeated periodically. Training must provide the employee an opportunity to handle the respirator, have it fitted properly, test its facepiece-to-face seal, wear it in normal air for a familiarity period, and wear it in a test atmosphere.

(4) A regular maintenance program must be instituted including cleaning, inspecting, and testing of all respiratory equipment. Respirators used for emergency response must be inspected after each use and at least monthly to assure that they are in satisfactory working condition. A written record of inspection must be maintained.

(5) Distribution areas for equipment used in emergencies must be readily accessible to employees.

A positive-pressure self-contained breathing apparatus (SCBA) offers the best protection to employees involved in controlling emergency situations. It must have a minimum service life rating of at least 30 minutes. Conditions that require a positive-pressure SCBA include the following:

(1) Leaking cylinders or containers, smoke from chemical fires, or chemical spills that indicate high potential for exposure to toxic substances.

(2) Atmospheres with unknown contaminants or unknown contaminant concentrations, confined spaces that may contain toxic substances, or

oxygen-deficient atmospheres.

Emergency situations may involve entering confined spaces to rescue employees who are overcome by toxic compounds or who lack oxygen. These permit-required confined spaces include tanks, vaults, pits, sewers, pipelines, and vessels. Entry into permit-required confined spaces can expose the employee to a variety of hazards, including toxic gases, explosive atmospheres, oxygen deficiency, electrical hazards, and hazards created by mixers and impellers that have not been deactivated and locked out. Personnel must never enter a permit-required confined space unless the atmosphere has been tested for adequate oxygen, combustibility, and toxic substances. Conditions in a permit-required confined space must be considered immediately dangerous to life and health unless shown otherwise. If a permit-required confined space must be entered in an emergency, the following precautions must be adhered to:

(1) All lines containing inert, toxic, flammable, or corrosive materials must be disconnected or blocked off before entry.

(2) All impellers, agitators, or other moving equipment inside the vessel must be locked out.

(3) Appropriate personal protective equipment must be worn by employees before entering the vessel. Mandatory use of harnesses must be stressed.

(4) Rescue procedures must be specifically designed for each entry. A trained stand-by person must be present. This person should be assigned a fully charged, positive-pressure, self-contained breathing apparatus with a full facepiece. The stand-by person must maintain unobstructed lifelines and communications to all workers within the permit-required confined space and be prepared to summon rescue personnel if necessary. The stand-by person should not enter the confined space until adequate assistance is present. While awaiting rescue personnel, the stand-by person may make a rescue attempt utilizing lifelines from outside the permit-required confined space.

A more complete description of procedures to follow while working in confined spaces may be found in the OSHA standard for permit-required confined spaces, 29 CFR 1910.145 and the National Institute for Occupational Safety and Health (NIOSH) Publication Number 80-106, *Criteria for a Recommended Standard...Working in Confined Spaces*.

MEDICAL ASSISTANCE

In a major emergency, time is critical factor in minimizing injuries. Most small businesses do not have a formal medical program, but they are required to have the following medical and first-aid services:

(1) In the absence of an infirmary, clinic, or hospital in close proximity to the workplace that can be used for treatment of all injured employees, the employer must ensure that a person or persons are adequately trained to render first aid. The first aid is to begin within 3 to 4 minutes of the incident if the injury is of a serious nature.

(2) Where the eyes or body of any employee may be exposed to injurious corrosive materials, eye washes or suitable equipment for quick drenching or flushing must be provided in the work area for immediate emergency use. Employees must be trained to use the equipment.

(3) The employer must ensure the ready availability of medical personnel for advice and consultation on matters of employees' health. This does not mean that health care must be provided, but rather that, if health problems develop in the workplace, medical help will be available to resolve them.

To fulfill the above requirements, the following actions should be considered:

(1) Survey the medical facilities near the place of business and make arrangements to handle routine and emergency cases. A written emergency medical procedure should then be prepared for handling accidents with minimum confusion.

(2) If the business is located far from medical facilities, at least one and preferably more employees on each shift must be adequately trained to render first aid. The American Red Cross, some insurance carriers, local safety councils, fire departments, and others may be contacted for this training.

(3) First-aid supplies should be provided for emergency use. This equipment should be ordered through consultation with a physician.

(4) Emergency phone numbers should be posted in conspicuous places near or on telephones.

(5) Sufficient ambulance service should be available to handle any

emergency. This requires advance contact with ambulance services to ensure they become familiar with plant location, access routes, and hospital locations.

SECURITY

During an emergency, it is often necessary to secure the area to prevent unauthorized access and to protect vital records and equipment. An off-limits area must be established by cordoning off the area with ropes and signs. It may be necessary to notify local law enforcement personnel or to employ private security personnel to secure the area and prevent the entry of unauthorized personnel.

Certain records also may need to be protected, such as essential accounting files, legal documents, and lists of employees' relatives to be notified in case of emergency. These records may be stored in duplicate outside the plant or in protected secure locations within the plant.

SOME OSHA REQUIREMENTS

The following is a list of some of the OSHA requirements pertaining to emergency response. These references refer to appropriate sections of the Occupational Safety and Health Standards (*Title 29, Code of Federal Regulations, Part 1910*, which are the OSHA General Industry Standards).

Subpart E - Means of Egress

1910.37 Means of egress
1910.38 Employee emergency plans and fire prevention plans
Appendix to Subpart E - Means of egress

Subpart H - Hazardous Materials

1910.119 Process safety management of highly hazardous chemicals
1910.120 Hazardous waste operations and emergency response.

Subpart I - Personal Protective Equipment

1910.132 General requirements - personnel protection
1910.133 Eye and face protection
1910.134 Respiratory protection
1910.135 Occupational head protection
1910.136 Occupational foot protection

1910.138 Hand protection

Subpart J - General Environmental Controls

1910.146 Permit-required confined spaces
1910.147 Control of hazardous energy sources

Subpart K - Medical and First Aid

1910.151 Medical services and first aid

Subpart L- Fire Protection

1910.155-156 Fire protection and fire brigades
1910.157- 163 Fire suppression equipment
1910.164 Fire detection systems
1910.165 Employee alarm systems
Appendix A-E of Subpart L

Subpart R - Special Industries, Electrical Power

Generation, Transmission, and Distribution

Subpart Z - Toxic and Hazardous Substances

1910.1030 Bloodborne pathogens
1910.1200 Hazard communication

INFORMATION AND CONSULTATION SERVICES

Much of the planning and program development for responding to occupational emergencies will require professional assistance. Many public and private agencies provide information and services free or at minimal cost (e.g., Federal, State, and local health and labor departments, insurance carriers, and local universities). After having exhausted these sources, consider using a private consultant selected by matching his/her specialty with your specific needs.

If there is a carrier for workers' compensation insurance, that company probably has safety and health specialists on staff who are familiar with minimum standards and technical information currently available and may be quite helpful in advising about accident and illness prevention and control.

Trade associations often have technical materials, programs, and industry data available for specific needs.

The Department of Labor through the Occupational Safety and Health Administration (OSHA) provides information in interpreting the law and on meeting the applicable standards. This information is available free of charge or obligation. The OSHA Area Office or State Plan Office nearest to the plant may be contacted for this information.

The Department of Health and Human Services through the National Institute for Occupational Safety and Health (NIOSH) provides printed material relating to employee safety and health in the workplace. Staff from this agency will perform industrial hygiene surveys of plants upon request of employers or employees.

Machine or product manufacturers can be helpful in providing additional information on precautions to take in using their products. Any special problems should be referred to them first. Professional societies in the safety, industrial hygiene, and medical fields issue publications in the form of journals, pamphlets, and books that may be quite useful (e.g., American Society of Safety Engineers or the Occupational Health Institute). They can also recommend individuals from their societies to serve as consultants.

Local colleges and universities sometimes have industrial hygiene, public health, medical, or other relevant departments with faculty and libraries to assist.

OTHER SOURCES OF OSHA ASSISTANCE

Effective management of worker safety and health protection is a decisive factor in reducing the extent and severity of work-related injuries and their related costs. To assist employers and employees in developing effective safety and health programs, OSHA published recommended *Safety and Health Management Guidelines* [*Federal Register* 54(18): 3908-3916, January 26, 1988]. These voluntary guidelines apply to all places of employment covered by OSHA.

The guidelines identify four general elements that are critical to the development of a successful safety and health management program:

(1) Management commitment and employee involvement;

(2) Worksite analysis;

(3) Hazard prevention and control; and

(4) Safety and health training.

The guidelines recommend specific actions, under each of these general elements, to achieve an effective safety and health program. A single free copy of the guidelines can be obtained from the OSHA Publications Office, U.S. Department of Labor, 200 Constitution Avenue, N.W., Room N3101, Washington DC 20210, by sending a self-addressed mail label with your request.

STATE OCCUPATIONAL SAFETY AND HEALTH PLANS

The *Occupational Safety and Health Act of 1970*, under Section 18(b), encourages States to develop and operate their own State job safety and health plans under the approval and monitoring of OSHA. Twenty-five states and territories operate such plans. They are required to set standards that are at least as effective as the federal, conduct inspections to enforce those standards (including inspections in response to workplace complaints), cover State and local government employees, and operate occupational safety and health training and education programs. In addition, all States provide on-site consultation to help employers to identify and correct workplace hazards. Such consultation may be provided either under the plan or through a special agreement under section 7(c)(1) of the Act. Federal OSHA does not conduct enforcement activities in the state plan States, except in very limited circumstances.

A listing of those States that operate approved State plans can be obtained from your local OSHA Area Office.

A comprehensive customer service poster listing OSHA services and how to contact agency Regional, Area, and District offices is available from OSHA's Publications Office, 200 Constitution Avenue, N.W. Washington D.C. 20210, Rm N3101. Telephone (202) 219-4667.

FREE ON-SITE CONSULTATION

Free on-site safety and health consultation services are available to employers in all states who want help in establishing and maintaining a safe and healthful workplace. This service is largely funded by OSHA. Primarily developed for smaller employers with more hazardous

operations, the consultation service is delivered by state governments employing professional safety consultants and health consultants. Comprehensive assistance includes an appraisal of all mechanical systems, physical work practices, and environmental hazards of the workplace and all aspects of the employer's present job safety and health program.

This program is completely separate from OSHA's inspection efforts. No penalties are proposed or citations issued for any safety or health problems identified by the consultant. The service is confidential.

For more information concerning consultation services, contact your local OSHA Area Office.

VOLUNTARY PROTECTION PROGRAMS

Voluntary Protection programs (VPPs) and onsite consultation services, when coupled with an effective enforcement program, expand worker protector to help meet the goals of the OSH Act. The three VPPs - Star, Merit, and Demonstration - are designed to recognize outstanding achievement by companies that have successfully incorporated comprehensive safety and health programs into their total management system. They motivate others to achieve excellent safety and health results in the same outstanding way, and they establish a cooperative relationship among employers, employees, and OSHA.

For additional information on VPPs and how to apply, contact your local OSHA Area Office.

TRAINING AND EDUCATION

OSHA's area offices offer a variety of informational services, such as publications, audiovisual aids, technical advice, and speakers for special events. OSHA's Training Institute in Des Plaines, IL, provides basic and advanced courses in safety and health for federal and state compliance officers, state consultants, federal agency personnel, and private sector employers, employees, and their representatives.

OSHA also provides funds to nonprofit organizations, through grants, to conduct workplace training and education in subjects where OSHA believes there is a lack of workplace training. Grants are awarded annually. Grant recipients are expected to contribute 20 percent of the total grant cost.

For more information on grants, training, and education, contact the OSHA Training Institute, Office of Training and Education, 1555 Times Drive, Des Plaines, IL 60018, (847) 297-4810.

For further information on any OSHA program, contact your nearest OSHA area or regional office.

OSHA AREA OFFICE SERVICES

OSHA Area Offices are prime sources of information, publications, and assistance in understanding the requirements of standards.

They can furnish:

1. Job Safety and Health Protection (the OSHA workplace poster),
2. The necessary forms for OSHA recordkeeping requirements,
3. Information on applying for variances,
4. Off-site advice on controlling various hazards,
5. Copies of various publications and fact sheets,
6. Safety and health complaint investigations,
7. Investigations of complaints alleging discrimination for exercising safety and health rights,
8. Speakers at public events on safety and health topics, and
9. Advice and consultation on maintaining and calibrating some monitoring measuring equipment.

In addition they can provide referral services regarding:

1. Free on-site consultation,
2. Grant recipients with projects, products, or services related to hazards,
3. Training and education delivery resources,
4. Other Federal agencies and their areas of jurisdiction,
5. Voluntary protection programs under which employers with exemplary programs and safety records can be exempted from routine OSHA inspections (not all States have implemented this program), and
6. The National Institute for Occupational Safety and Health for health hazard evaluations.

These offices may be contacted by phone, by mail, by Fax, or in person, without fear of initiating an inspection.

ADDITIONAL SOURCES OF INFORMATION

Safety Data Sheets, Guides and Manuals

AIHA Hygienic Guide Series. American Industrial Hygiene Association, 2700 Prosperity Ave., Fairfax, VA 22031. Separate data sheets on specific substances giving hygienic standards, properties, industrial hygiene practices, specific procedures, and references.

ANSI Standards, Z37 Series, Acceptable Concentrations of Toxic Dusts and Gases. American National Standards Institute, 11 West 42nd Street, New York, NY 10036. These guides represent a consensus of interested parties concerning minimum safety requirements for the storage, transportation, and handling of toxic substances; they are intended to aid the manufacturers, the consumer, and the general public.

ASTM Standards with Related Material. American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

Standards and Specification Groups

American National Standards Institute, 11 West 42nd Street, New York, NY 10036, coordinates and administers the federated voluntary standardization system in the United States.

American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 10103. World's largest source of voluntary consensus standards for materials, products, systems, and services.

Fire Protection Organizations

Factory Insurance Association, 85 Woodland Street, Hartford, CT 06105. Composed of capital stock insurance companies to provide engineering, inspections, and loss adjustment service to industry.

Factory Mutual System, 1151 Boston-Providence Turnpike, Norwood, MA 02062. An industrial fire protection, engineering, and inspection bureau established and maintained by mutual fire insurance companies.

National Fire Protection Association, 470 Batterymarch Park, Quincy, MA 02269. The clearinghouse for information on fire protection and fire prevention also writes NFPA standards. Nonprofit technical and educational organization.

Underwriter Laboratories, Inc., 207 East Ohio Street, Chicago, IL 60611. Not-for-profit organization whose laboratories publish annual lists of manufacturers whose products proved acceptable under appropriate standards.

Medical Consultation

Arrange for a local doctor to advise on workplace medical matters. Contact the local Red Cross chapter for assistance in first-aid training. If a local chapter cannot be located write:

American National Red Cross
National Headquarters Safety Programs
18th and E Streets, N.W.
Washington, D.C. 20006

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1990.

U.S. Department of Health and Human Services. National Institute for Occupational Safety and Health, *Safety and Health Alert: Request for Assistance In Preventing Homicide In the Workplace*. U.S. Department of Health and Human Services, Cincinnati, Ohio, September 1993, Number 93-109.

Public Health Service. National Institute for Occupational Safety and Health. *A Guide to Industrial Respiratory Protection*. NIOSH Publication No. 76-189. Cincinnati, 1976.

Criteria for a Recommended Standard...Working in Confined Spaces. NIOSH Publication. No.80-106. Cincinnati, 1980.

Respiratory Protection...An Employer's Manual. NIOSH Publication No. 78-198A. Cincinnati, October 1978.

Self-Evaluation of Occupational Safety and Health Programs. NIOSH Publication No. 78-187. Cincinnati, 1978.

U.S. Department of Labor
Program Highlights

Fact Sheet No. OSHA 92-19

RESPONDING TO WORKPLACE EMERGENCIES

Employers should establish effective safety and health programs and prepare their workers to handle emergencies before they arise.

Planning

Where required by the Occupational Safety and Health Administration (OSHA), firms with more than 10 employees must have a written emergency action plan; smaller companies may communicate their plans orally. [See 29 Code of Federal Regulation (CFR) Part 1910.38(a) for further information.] Essential to an effective emergency action plan are top management support and commitment and the involvement of all employees.

Management should review plans with employees initially and whenever the plan itself, or employees responsibilities under it, change. Plans should be re-evaluated and updated periodically. Emergency procedures, including the handling of any toxic chemicals, should include:

- Escape procedures and escape route assignments.
- Special procedures for employees who perform or shut down critical plant operations.
- A system to account for all employees after evacuation.
- Rescue and medical duties for employees who perform them.
- Means for reporting fires and other emergencies.
- Contacts for information about the plan.

Chain of Command

An emergency response coordinator and a back-up coordinator must be designated. The coordinator may be responsible for plant-wide operations, public information and ensuring that outside aid is called in. A back-up coordinator ensures that a trained person is always available. Duties of the coordinator include:

- Determining what emergencies may occur and seeing that emergency procedures are developed to address them.

- Directing all emergency activities including evacuation of personnel.
- Ensuring that outside emergency services such as medical aid and local fire departments are called when necessary.
- Directing the shutdown of plant operations when necessary.

Emergency Response Teams

Members of emergency response teams should be thoroughly trained for potential emergencies and physically capable of carrying out their duties; know about toxic hazards in the workplace and be able to judge when to evacuate personnel or depend on outside help (e.g. when a fire is too large for them to handle). One or more teams must be trained in:

- Use of various types of fire extinguishers.
- First aid, including cardiopulmonary resuscitation (CPR).
- The requirements of the OSHA bloodborne pathogens standard.
- Shutdown procedures.
- Chemical spill control procedures.
- Use of self-contained breathing apparatus (SCBA).
- Search and emergency rescue procedures.
- Hazardous materials emergency response in accordance with 29 CFR 1910.120.

Response Activities

Effective emergency communication is vital. An alternate area for a communications center other than management offices should be established in the plans and the emergency response coordinator should operate from this center. Management should provide emergency alarms and ensure that employees know how to report emergencies. An updated list of key personnel and off-duty telephone numbers should be maintained.

A system should be established for accounting for personnel once workers have been evacuated with a person in the control center responsible for notifying police or emergency response team members of persons believed missing.

Effective security procedures, such as cordoned off areas, can prevent unauthorized access and protect vital records and equipment. Duplicate records can be kept in off-site locations for essential accounting files, legal documents and lists of employees relatives to be notified in case of

emergency.

Training

Every employee needs to know details of the emergency action plan, including evacuation plans, alarm systems, reporting procedures for personnel, shutdown procedures, and types of potential emergencies. Drills should be held at random intervals, at least annually, and include, if possible, outside police and fire authorities.

Training must be conducted initially, when new employees are hired, and at least annually. Additional training is needed when new equipment, materials, or processes are introduced, when

procedures have been updated or revised, or when exercises show that employee performance is inadequate.

Personal Protection

Employees exposed to accidental chemical splashes, falling objects, flying particles, unknown atmospheres with inadequate oxygen or toxic gases, fires, live electrical wiring, or similar emergencies need personal protective equipment, including:

- Safety glasses, goggles, or face shields for eye protection.
- Hard hats and safety shoes.
- Properly selected and fitted respirators.
- Whole body coverings, gloves, hoods, and boots.
- Body protection for abnormal environmental conditions such as extreme temperatures.

Medical Assistance

Employers not near an infirmary, clinic, or hospital should have someone on-site trained in first aid, have medical personnel readily available for advice and consultation, and develop written emergency medical procedures.

It is essential that first aid supplies are available to the trained medical personnel, that emergency phone numbers are placed in conspicuous places near or on telephones, and prearranged ambulance services for any emergency are available.

Further Information

More detailed information on workplace emergencies is provided in "How to Prepare for Workplace Emergencies" (OSHA 3088) available free from OSHA Publications, Room N3101, 200 Constitution Ave., N.W., Washington, D.C. 20210, telephone 202-219-4667, or local OSHA offices.

This is one of a series of fact sheets highlighting U.S. Department of Labor programs. It is intended as a general description only and does not carry the force of legal opinion. This information will be made available to sensory impaired individuals upon request. Voice phone: 202-219-8151. TDD message referral phone: 1-800-326-2577.

Discussion / Overheads - 1.97 MB

Student Handouts - 64 KB

This information was found July 2002 at
http://www.osha-slc.gov/SLTC/smallbusiness/sec10.html

(SAMPLE PROGRAM)
Emergency Action Plan for

(XYZ Company, Inc.)

The purpose of this plan is to prepare employees for emergency situations which may arise in the course of their employment at this facility. The preservation of life is of paramount importance to our company and it is our policy to err on the side of protecting our employees and customers if there is a question. The procedures set down in this plan are to be communicated to all employees and to customers and frequenters who are in this facility. Any changes to this plan will be communicated to all affected employees as soon as it is made.

FIRE

In case of a fire alarm sounding or discovery of a fire, employees should move immediately to an exit. If the alarm has not sounded, then the alarm should be sounded as employees are evacuating. All employees should go to the assembly area at _____ where they are to remain until released by management. Management shall designate an employee from that area to notify the fire department from the outside of the facility. Management shall designate an employee(s) to meet the fire department at the main entrance and guide them to the fire location. Material safety data sheets shall be kept on the outside of the facility and provided to the fire department on their arrival along with a map showing the location of all chemicals in the facility. Each department supervisor is responsible for accounting for his/her personnel and reporting to the senior management representative present. The visitor book from the front desk should be brought out by office personnel and all visitors must be accounted for. Management shall designate personnel from the maintenance department to shut down gas and electrical power to the facility. This operation shall only be done if there is no danger to the personnel doing the shutdown. No employee shall reenter the facility until told to do so by both management and the fire department. Attempts to rescue anyone trapped in the facility will be done by fire department personnel only. Basic first aid will be provided at the assembly area until fire department personnel can take over any injured persons.

MEDICAL EMERGENCIES

In the event of an injury to anyone in this facility, first aid will be provided by trained first aid personnel. These personnel will have received training and be certified in basic first aid and CPR.

The first aid personnel will follow the company's Bloodborne Pathogen Program during all first aid procedures. The fire department will be notified to provide assistance for serious cases or if there is any doubt as to the extent of the injury. Management will delegate an employee to meet the fire department and guide them to the injured individual. Regardless of the extent of the injury, an accident investigation will be started immediately after the injured person has received the assistance they need. Management personnel will follow-up on the condition of the injured person and provide whatever assistance they can provide.

WEATHER EMERGENCIES

Weather emergencies can strike at any time of year and any time of day. When weather conditions warrant, a radio in the office area will be tuned to a local weather station to monitor the situation. If a severe weather warning is issued, company operations will be evaluated by the senior management officer present to determine whether any operation should be canceled until the threatening weather has passed. During tornado season, whenever a tornado watch is issued, the radio will be turned on and monitored. If a tornado warning is issued, all operations will be shut down immediately and employees shall go to the nearest tornado shelter. Employees shall remain in the shelter area until told to return to work by management personnel. In the event of a tornado strike without adequate warning, employees shall take cover wherever possible, preferably in interior rooms or under heavy equipment. After the tornado has passed, employees shall go to the assembly area and management shall take a head count to determine the location and condition of all employees and visitors. If the building is damaged, electricity and gas will be shut down by designated maintenance personnel. The fire department will be notified immediately in case of injury or failure to located all personnel and visitors.

BOMB THREATS

If a bomb threat is called in to the facility, the person receiving the call will get as much information as is possible. Listen to the caller and to any background noises to get as much information as is possible. When the caller is finished, notify the police and fire departments of the threat. Management must decide the validity of the threat and whether or not to evacuate the facility. If there is any doubt as to the validity of the threat, it must be treated as a real threat and the facility must be evacuated. Management will cooperate with authorities in searching the facility for possible explosive devices. All employees evacuated to the assembly area will remain there until told to return to the facility by both the police department and company management.

THREATS TO PERSONNEL

This company will not tolerate any threat of physical violence to any person in this facility. If there is the threat of physical violence to an employee or visitor, then that threat must be reported to management. If the threat is determined to be valid, then management will take whatever steps are necessary to insure that the person issuing the threat is denied access to the building. If it is another employee who issues the threat, then disciplinary action will be taken, and, if necessary, notification of the proper authorities will be made of the threat. If an armed, violent individual is present in the facility, then employees should cooperate with that individual, so long as there is no immediate danger to themselves or others. Police should be notified as soon as possible and employee should attempt to get the best description they can without endangering themselves.

EMERGENCY ACTION PLAN ADMINISTRATION

(Name) is responsible for the implementation and operation of this emergency action plan. Any questions or recommendations for change to this program should be directed to him/her.

This individual will also insure that all training that is conducted will be documented and that refresher training will be conducted on an annual basis or when the plan has been revised.

EMERGENCY ACTION PLAN CHECKLIST

	Yes	No	
1.	_____	_____	Is the plan in writing? (Not required for companies with ten or less employees.)
2.	_____	_____	Are emergency escape procedures and emergency escape routes assigned?
3.	_____	_____	Are procedures established to be followed by employees who remain to operate critical plan operations before they evacuate?
4.	_____	_____	Are procedures established to account for all employees after emergency evacuation has been completed?
5.	_____	_____	Are rescue and medical duties established for those employees who are to perform them?
6.	_____	_____	Are preferred means of reporting fires and other emergencies identified?
7.	_____	_____	Have the names or regular job titles of persons or departments who can be contacted for further information or explanation of duties under the plan been identified?
8.	_____	_____	Has an employee alarm system which complies with 29 CFR 1910.165 been established?
9.	_____	_____	If an employee alarm system is used for alerting fire brigade members, or for other purposes is a distinctive signal for each purpose used?
10.	_____	_____	Has the employer established the types (i.e., complete, partial) of evacuations to be used in emergency circumstances (advance planning)?
11.	_____	_____	Has the employer designated and trained a sufficient number of persons to assist in the safe and orderly evacuation of employees (generally one (1) warden per twenty employees).
12.	_____	_____	Has the employer reviewed the emergency action plan with each employee covered by the plan initially (when the plan is developed)? When employees' responsibilities or designated actions under the plan change, and whenever the plan is changed?

	Yes	No	
13.	_____	_____	Has the employer reviewed with each employee upon initial assignment those parts of the plan which the employee must know in the event of an emergency?
14.	_____	_____	Is the written plan (where required) kept at the workplace and made available for employee review?
15.	_____	_____	Does the written plan have a statement of policy/purpose?
16.	_____	_____	Do you have pre-emergency planning (details)?
17.	_____	_____	Have personnel roles been assigned, lines of authority determined?
18.	_____	_____	Has employee training been specified?
19.	_____	_____	Have emergency communications been set up?
20.	_____	_____	Has site security and control procedures and persons responsible been determined?

FIRST AID

Good administration of first aid is an important part of every program. It is recommended that first aid provisions of some sort be set up in all establishments regardless of size. This may range from a deluxe first aid kit to a well-staffed first aid and medical facility, depending on the size of the establishment.

In many small organizations and in field operations, it is neither practical nor justifiable to have qualified professional medical personnel available. In such cases, the best arrangement is to use individuals trained in first aid and CPR. However, a doctor should be available on an on-call or referral basis to take care of serious injuries.

There are two kinds of first aid treatment. One type is emergency treatment. According to the American Red Cross first aid textbook, "First aid is the immediate, temporary treatment given in the case of accident or sudden illness before the services of a physician can be secured." Proper first aid measures reduce suffering and place the injured person in a physician's hands in a better condition to receive subsequent treatment.

The other kind of first aid is the prompt attention and follow-up observation given to injuries, such as cuts, scratches, bruises, and burns, which are usually so minor that the injured person would not ordinarily seek medical attention. This is the definition of first aid OSHA refers to in its recordkeeping procedures.

A First Aid Program Should Include:

- Properly trained and designated first aid personnel on every shift.
- A first aid unit and supplies, or first aid kit.
- A first aid manual.
- Posted instructions for calling a physician and notifying the hospital that the patient is enroute.
- Posted method for transporting ill or injured employees and instructions for calling an ambulance or rescue squad.
- An adequate first aid recording system. (See Attached)

Emergency showers and eye wash fountains where chemicals are stored, handled or used.

FIRST AID LOG

_____

First Aid Station: _____

[Location] _____

Date	Time	Name	Type Of Accident	Type Of Injury	Type Of Treatment

FIRST AID POLICY (Sample)

It is the policy of this company to encourage/require the employee(s) to receive first aid and CPR training prior to starting on the job. The company has an arrangement with _____ to provide the necessary training at our expense/ your expense. This training is for your protection and for the protection of your fellow employees. The company does not require any employee to provide first aid or CPR in any emergency situation. First aid equipment is provided by the company and every effort is made to keep it up to date and fully equipped. If equipment is needed or used, management should be notified. Any injuries should be reported immediately to management. The Bloodborne Pathogen Program should be followed when dealing with bodily fluids and when a chance of exposure has occurred management shall be notified immediately.

(SAMPLE PROGRAM)
Fire Prevention Plan
for: _____

This company knows the importance of protecting our employees from the dangers associated with fire. It is our intent to identify those conditions that could lead to a fire, whether they are fuel sources or ignition sources, and control them as much as is possible. All employees have a responsibility to follow this program and to notify management of any condition that could lead to a fire condition. This plan does not and cannot cover all contingencies that could lead to a fire, but tries to identify those conditions known to be present in the facility and the steps to be taken to control them. If changes are made to this plan, employees will be notified immediately of any changes that affect them.

FUEL SOURCES

(Management should go through the facility and list all sources of fuel for fires. Then they should list the proper handling and storage procedures for those fuel sources.)

> EXAMPLE: Gasoline in the garage area. The gasoline must be storeed in a proper safety container. Lawnmowers, vehicles and other machinery using gasoline should not be fuled indoors and should never be fueled when hot. Gasoline should never be used to start fires or mixed with other liquids or containers that have contained other liquids. Only the amount of gasoline necessary to meet daily needs should be on site at any time.

IGNITION SOURCES

(Management should go through the facility and list all sources of ignition for fires. Then they should list the controls that are going to be used for those ignition sources.)

> EXAMPLE: Smoking is permitted throughout the facility. Smoking will no longer be permitted throughout the facility. Smoking may take place only in designated areas. Smoking outside those areas may lead to disciplinary action for the individual(s) involved.

MAINTENANCE OF FIRE CONTROL SYSTEMS

(Name) is responsible for maintaining the emergency lighting systems in this facility. Checks will be made of the functioning of these lights on a monthly basis and records will be kept of those checks.

(Name) is responsible for maintaining the fire alarm system in this facility. The manufacturers recommendations will be followed in maintaining these alarms and records will be kept of all maintenance done.

(Name) is responsible for maintaining the sprinkler system in this facility. The installers and manufacturers recommendations will be followed in maintaining this system and records will be kept of all maintenance done.

(Name) is responsible for maintaining the fire extinguishers in this facility. The manufacturers recommendations will be followed in maintaining these extinguishers. Monthly visual checks will be performed and records will be kept of the results of this visual check and any deficiencies.

CONTROL OF FUEL SOURCES

(Name) is responsible for the storage and handling of all flammable liquids in this facility. He/she will oversee the training of personnel in proper handling techniques and that proper containers and cabinets are used to store flammable liquids. Any questions regarding flammable liquid storage and handling at this facility should be directed to him/her.

(Name) is responsible for the disposal of solid combustible wastes. After collection and clean-up, all combustible wastes should be removed to proper containers and be properly secured. Buildups of combustible waste and trash are prohibited.

(Name) is responsible for the proper handling and storage of all flammable gases in this facility. All flammable gases shall be separated from oxygen sources at all times and must be stored away from intense heat sources. Even when empty, flammable gas cylinders must be handled as if they were full.

HOUSEKEEPING POLICY

Each department head is responsible for the housekeeping condition of their department. All waste material and trash must be collected and disposed of on a regular basis. Stockpiled material must be kept neat and orderly to control ignition

or damage to the material. Housekeeping equipment must be kept available in the work area and time must be made to keep the area as clean as possible. Under no

conditions should waste materials and trash be allowed to accumulate more that one day or to reach dangerous levels. Proper containers are available for the storage and disposal of rags or other material soaked in combustible or flammable liquids. These materials should not be stored and disposed of in standard containers. While housekeeping is everyone's responsibility, each department head will be held accountable for the condition of their work area.

FIRE PREVENTION PLAN ADMINISTRATION

(Name) is responsible for the implementation and operation of this plan. If there are any questions or recommendations for change to this plan, please see him/her.

FIRE PREVENTION PLAN
CHECKLIST

	Yes	No	
1.	_____	_____	Is the plan in writing? (Note exemption for ten (10) or less employees.)
2.	_____	_____	Is there a list of the major (significant) workplace fire hazards, potential ignition sources and their control procedures**,** including the type of fire protection equipment or systems to be used?
3.	_____	_____	Have the names or regular job titles of those personnel responsible for maintenance of equipment and systems installed to prevent or control ignitions or fires been identified?
4.	_____	_____	Have the names or regular job titles of those personnel responsible for contol of fuel source hazards been identified?
5.	_____	_____	Have housekeeping procedures been included in the written (where applicable) fire prevention plan?
6.	_____	_____	Have the employees been apprised of the hazards of the materials and processes to which they are exposed?
7.	_____	_____	Has the employer reviewed with each employee upon initial assignment those parts of the fire prevention plan which the employee must know in the event of an emergency?
8.	_____	_____	Is the written plan (where applicable) kept in the workplace and made available for employee review?
9.	_____	_____	Does the employer regularly and properly maintain equipment and systems installed on heat producing equipment to prevent accidental ignition of combustible materials (Examples: temperature limit switch on deep fat fryer)?
10.	_____	_____	Are Hot Work Permits used in areas where welding is being conducted?
11.	_____	_____	Has the employer held fire drills?
12.	_____	_____	Have adequate fire extinguishers of the proper capacity and type been provided in the work place?
13.	_____	_____	Have all employees that are expected to use fire extinguishers been properly instructed and training documented?

	Yes	No	
14.	_____	_____	Are fire watches used in welding jobs and are fire extinguishers on all welding units?
15.	_____	_____	Are regular inspection of fire prevention equipment, fire hazards and exit conducted?

29 CFR 1910 Subpart E
Exit Routes, Emergency Action Plans, and Fire Prevention Plans

1910.33 Table of contents.
This section lists the sections and paragraph headings contained in 1910.34 through 1910.39.

This Standard was revised and effective November 7, 2002

1910.34 Coverage and definitions.

(a) Every employer is covered.
(b) Exit routes are covered.
(c) Definitions.

1910.35 Compliance with NFPA 101-2000, Life Safety Code 2003.

1910.36 Design and construction requirements for exit routes.

(a) Basic requirements.
(b) The number of exit routes must be adequate.
(c) Exit discharge.
(d) An exit door must be unlocked.
(e) A side-hinged exit door must be used.
(f) The capacity of an exit route must be adequate.
(g) An exit route must meet minimum height and width requirements.
(h) An outdoor exit route is permitted.

1910.37 Maintenance, safeguards, and operational features for exit routes.

(a) The danger to employees must be minimized.
(b) Lighting and marking must be adequate and appropriate.
(c) The fire retardant properties of paints or solutions must be maintained.
(d) Exit routes must be maintained during construction, repairs, or alterations.
(e) An employee alarm system must be operable.

1910.38 Emergency action plans.

(a) Application.
(b) Written and oral emergency action plans.
(c) Minimum elements of an emergency action plan.
(d) Employee alarm system.
(e) Training.
(f) Review of emergency action plan.

1910.39 Fire prevention plans.

(a) Application.
(b) Written and oral fire prevention plans.
(c) Minimum elements of a fire prevention plan.
(d) Employee information.

29 CFR 1910 Subpart L
Portable Fire Extinguishers

1910 .157 Portable Fire Extinguishers
1910 .165 Employee Alarm Systems

1910.34 Coverage and definitions.

(a) Every employer is covered. Sections 1910.34 through 1910.39 apply to workplaces in general industry except mobile workplaces such as vehicles or vessels.

(b) Exits routes are covered. The rules in 1910.34 through 1910.39 cover the minimum requirements for exit routes that employers must provide in their workplace so that employees may evacuate the workplace safely during an emergency. Sections 1910.34 through 1910.39 also cover the minimum requirements for emergency action plans and fire prevention plans.

(c) Definitions.

Electroluminescent means a light-emitting capacitor. Alternating current excites phosphor atoms when placed between the electrically conductive surfaces to produce light. This light source is typically contained inside the device.

Exit means that portion of an exit route that is generally separated from other areas to provide a protected way of travel to the exit discharge. An example of an exit is a two-hour fire resistance-rated enclosed stairway that leads from the fifth floor of an office building to the outside of the building.

Exit access means that portion of an exit route that leads to an exit. An example of an exit access is a corridor on the fifth floor of an office building that leads to a two-hour fire resistance-rated enclosed stairway (the Exit).

Exit discharge means the part of the exit route that leads directly outside or to a street, walkway, refuge area, public way, or open space with access to the outside. An example of an exit discharge is a door at the bottom of a two-hour fire resistance-rated enclosed stairway that discharges to a place of safety outside the building.

Exit route means a continuous and unobstructed path of exit travel from any point within a workplace to a place of safety (including refuge areas). An exit route consists of three parts: The exit access; the exit; and, the exit discharge. (An exit route includes all vertical and horizontal areas along the route.)

High hazard area means an area inside a workplace in which operations include high hazard materials, processes, or contents.

Occupant load means the total number of persons that may occupy a workplace or portion of a workplace at any one time. The occupant load of a workplace is calculated by dividing the gross floor area of the workplace or portion of a workplace by the occupant load factor for that particular type of workplace occupancy. Information regarding "Occupant load" is located in NFPA 101-2000, Life Safety Code.

Refuge area means either:

(1) A space along an exit route that is protected from the effects of fire by separation from other spaces within the building by a barrier with at least a one-hour fire resistance-rating; or

(2) A floor with at least two spaces, separated from each other by smoke-resistant partitions, in a building protected throughout by an automatic sprinkler system that complies with § 1910.159 of this part.

Self-luminous means a light source that is illuminated by a self-contained power source (e.g., tritium) and that operates independently from external power sources. Batteries are not acceptable self-contained power sources. The light source is typically contained inside the device.

1910.35 Compliance with NFPA 101-2000, Life Safety Code 2003.

An employer who demonstrates compliance with the exit route provisions of NFPA 101-2000, the Life Safety Code, will be deemed to be in compliance with the corresponding requirements in § § 1910.34, 1910.36, and 1910.37.

1910.36 Design and construction requirements for exit routes.

(a) Basic requirements. Exit routes must meet the following design and construction requirements:

(1) An exit route must be permanent. Each exit route must be a permanent part of the workplace.

(2) An exit must be separated by fire resistant materials. Construction materials used to separate an exit from other parts of the workplace must have a one-hour fire resistance-rating if the exit connects three or fewer stories and a two-hour fire resistance-rating if the exit connects four or more stories.

(3) Openings into an exit must be limited. An exit is permitted to have only those openings necessary to allow access to the exit from occupied areas of the workplace, or to the exit discharge. An opening into an exit must be protected by a self-closing fire door that remains closed or automatically closes in an emergency upon the sounding of a fire alarm or employee alarm system. Each fire door, including its frame and hardware, must be listed or approved by a nationally recognized testing laboratory. Section 1910.155(c)(3)(iv)(A) of this part defines "listed" and § 1910.7 of this part defines a "nationally recognized testing laboratory."

(b) The number of exit routes must be adequate.

(1) Two exit routes. At least two exit routes must be available in a workplace to permit prompt evacuation of employees and other building occupants during an emergency, except as allowed in paragraph (b)(3) of this section. The exit routes must be located as far away as practical from each other so that if one exit route is blocked by fire or smoke, employees can evacuate using the second exit route.

(2) More than two exit routes. More than two exit routes must be available in a workplace if the number of employees, the size of the building, its occupancy, or the arrangement of the workplace is such that all employees would not be able to evacuate safely during an emergency.

(3) A single exit route. A single exit route is permitted where the number of employees, the size of the building, its occupancy, or the arrangement of the workplace is such that all employees would be able to evacuate safely during an emergency.
Note to paragraph 1910.36(b): For assistance in determining the number of exit routes necessary for your workplace, consult NFPA 101-2000, Life Safety Code.

(c) Exit discharge.

(1) Each exit discharge must lead directly outside or to a street, walkway, refuge area, public way, or open space with access to the outside.

(2) The street, walkway, refuge area, public way, or open space to which an exit discharge leads must be large enough to accommodate the building occupants likely to use the exit route.

(3) Exit stairs that continue beyond the level on which the exit discharge is located must be interrupted at that level by doors, partitions, or other effective means that clearly indicate the direction of travel leading to the exit discharge.

(d) An exit door must be unlocked.

(1) Employees must be able to open an exit route door from the inside at all times without keys, tools, or special knowledge. A device such as a panic bar that locks only from the outside is permitted on exit discharge doors.

(2) Exit route doors must be free of any device or alarm that could restrict emergency use of the exit route if the device or alarm fails.

(3) An exit route door may be locked from the inside only in mental, penal, or correctional facilities and then only if supervisory personnel are continuously on duty and the employer has a plan to remove occupants from the facility during an emergency.

(e) A side-hinged exit door must be used.

(1) A side-hinged door must be used to connect any room to an exit route.

(2) The door that connects any room to an exit route must swing out in the direction of exit travel if the room is designed to be occupied by more than 50 people or if the room is a high hazard area (i.e., contains contents that are likely to burn with extreme rapidity or explode).

(f) The capacity of an exit route must be adequate.

(1) Exit routes must support the maximum permitted occupant load for each floor served.

(2) The capacity of an exit route may not decrease in the direction of exit route travel to the exit discharge.

Note to paragraph 1910.36(f): Information regarding "Occupant load" is located in NFPA 101-2000, Life Safety Code 2003.

(g) An exit route must meet minimum height and width requirements.

(1) The ceiling of an exit route must be at least seven feet six inches (2.3 m) high. Any projection from the ceiling must not reach a point less than six feet eight inches (2.0 m) from the floor.

(2) An exit access must be at least 28 inches (71.1 cm) wide at all points. Where there is only one exit access leading to an exit or exit discharge, the width of the exit and exit discharge must be at least equal to the width of the exit access.

(3) The width of an exit route must be sufficient to accommodate the maximum permitted occupant load of each floor served by the exit route.

(4) Objects that project into the exit route must not reduce the width of the exit route to less than the minimum width requirements for exit routes.

(h) An outdoor exit route is permitted. Each outdoor exit route must meet the minimum height and width requirements for indoor exit routes and must also meet the following requirements:

(1) The outdoor exit route must have guardrails to protect unenclosed sides if a fall hazard exists;

(2) The outdoor exit route must be covered if snow or ice is likely to accumulate along the route, unless the employer can demonstrate that any snow or ice accumulation will be removed before it presents a slipping hazard;

(3) The outdoor exit route must be reasonably straight and have smooth, solid, substantially level walkways; and

(4) The outdoor exit route must not have a dead-end that is longer than 20 feet (6.2 m).

1910.37 Maintenance, safeguards, and operational features for exit routes.

(a) The danger to employees must be minimized.

(1) Exit routes must be kept free of explosive or highly flammable furnishings or other decorations.

(2) Exit routes must be arranged so that employees will not have to travel toward a high hazard area, unless the path of travel is effectively shielded from the high hazard area by suitable partitions or other physical barriers.

(3) Exit routes must be free and unobstructed. No materials or equipment may be placed, either permanently or temporarily, within the exit route. The exit access must not go through a room that can be locked, such as a bathroom, to reach an exit or exit discharge, nor may it lead into a dead-end corridor. Stairs or a ramp must be provided where the exit route is not substantially level.

(4) Safeguards designed to protect employees during an emergency (e.g., sprinkler systems, alarm systems, fire doors, exit lighting) must be in proper working order at all times.

(b) Lighting and marking must be adequate and appropriate.

(1) Each exit route must be adequately lighted so that an employee with normal vision can see along the exit route.

(2) Each exit must be clearly visible and marked by a sign reading "Exit."

(3) Each exit route door must be free of decorations or signs that obscure the visibility of the exit route door.

(4) If the direction of travel to the exit or exit discharge is not immediately apparent, signs must be posted along the exit access indicating the direction of travel to the nearest exit and exit discharge. Additionally, the line-of-sight to an exit sign must clearly be visible at all times.

(5) Each doorway or passage along an exit access that could be mistaken for an exit must be marked "Not an Exit" or similar designation, or be identified by a sign indicating its actual use (e.g., closet).

(6) Each exit sign must be illuminated to a surface value of at least five foot-candles (54 lux) by a reliable light source and be distinctive in color. Self-luminous or electroluminescent signs that have a minimum luminance surface value of at least .06 footlamberts (0.21 cd/m^2) are permitted.

(7) Each exit sign must have the word "Exit" in plainly legible letters not less than six inches (15.2 cm) high, with the principal strokes of the letters in the word "Exit" not less than three-fourths of an inch (1.9 cm) wide.

(c) The fire retardant properties of paints or solutions must be maintained. Fire retardant paints or solutions must be renewed as often as necessary to maintain their fire retardant properties.

(d) Exit routes must be maintained during construction, repairs, or alterations. (1) During new construction, employees must not occupy a workplace until the exit routes required by this subpart are completed and ready for employee use for the portion of the workplace they occupy.

(2) During repairs or alterations, employees must not occupy a workplace unless the exit routes required by this subpart are available and existing fire protections are maintained, or until alternate fire protection is furnished that provides an equivalent level of safety.

(3) Employees must not be exposed to hazards of flammable or explosive substances or equipment used during construction, repairs, or alterations, that are beyond the normal permissible conditions in the workplace, or that would impede exiting the workplace.

(e) An employee alarm system must be operable. Employers must install and maintain an operable employee alarm system that has a distinctive signal to warn employees of fire or other emergencies, unless employees can promptly see or smell a fire or other hazard in time to provide adequate warning to them. The employee alarm system must comply with § 1910.165.

1910.38 Emergency action plans.

(a) Application. An employer must have an emergency action plan whenever an OSHA standard in this part requires one. The requirements in this section apply to each such emergency action plan.

(**b) Written and oral emergency action plans.** An emergency action plan must be in writing, kept in the workplace, and available to employees for review. However, an employer with 10 or fewer employees may communicate the plan orally to employees.

(c) Minimum elements of an emergency action plan. An emergency action plan must include at a minimum:

(1) Procedures for reporting a fire or other emergency;

(2) Procedures for emergency evacuation, including type of evacuation and exit route assignments;

(3) Procedures to be followed by employees who remain to operate critical plant operations before they evacuate;

(4) Procedures to account for all employees after evacuation;

(5) Procedures to be followed by employees performing rescue or medical duties; and

(6) The name or job title of every employee who may be contacted by employees who need more information about the plan or an explanation of their duties under the plan.

(d) Employee alarm system. An employer must have and maintain an employee alarm system. The employee alarm system must use a distinctive signal for each purpose and comply with the requirements in § 1910.165.

(e) Training. An employer must designate and train employees to assist in a safe and orderly evacuation of other employees.

(f) Review of emergency action plan. An employer must review the emergency action plan with each employee covered by the plan:

(1) When the plan is developed or the employee is assigned initially to a job;

(2) When the employee's responsibilities under the plan change; and

(3) When the plan is changed.

1910.39 Fire prevention plans.

(a) Application. An employer must have a fire prevention plan when an OSHA standard in this part requires one. The requirements in this section apply to each such fire prevention plan.

(b) Written and oral fire prevention plans. A fire prevention plan must be in writing, be kept in the workplace, and be made available to employees for review. However, an employer with 10 or fewer employees may communicate the plan orally to employees.

(c) Minimum elements of a fire prevention plan. A fire prevention plan must include:

(1) A list of all major fire hazards, proper handling and storage procedures for hazardous materials, potential ignition sources and their control, and the type of fire protection equipment necessary to control each major hazard;

(2) Procedures to control accumulations of flammable and combustible waste materials;

(3) Procedures for regular maintenance of safeguards installed on heat-producing equipment to prevent the accidental ignition of combustible materials;

(4) The name or job title of employees responsible for maintaining equipment to prevent or control sources of ignition or fires; and

(5) The name or job title of employees responsible for the control of fuel source hazards.

(d) Employee information. An employer must inform employees upon initial assignment to a job of the fire hazards to which they are exposed. An employer must also review with each employee those parts of the fire prevention plan necessary for self-protection.

1910.120 Hazardous waste operations and emergency response.
* * * * *
(l) (1)(ii) Employers who will evacuate their employees from the danger area when an emergency occurs, and who do not permit any of their employees to assist in handling the emergency, are exempt from the requirements of this paragraph if they provide an emergency action plan complying with 29 CFR
1910.38. * * * * * * * *

(p) (8) (i) Emergency response plan. An emergency response plan shall be developed and implemented by all employers. Such plans need not duplicate any of the subjects fully addressed in the employer's contingency planning required by permits, such as those issued by the U.S. Environmental Protection Agency, provided that the contingency plan is made part of the emergency response plan. The emergency response plan shall be a written portion of the employer's safety and health program required in paragraph (p)(1) of this section. Employers who will evacuate their employees from the worksite location when an emergency occurs and who do not permit any of their employees to assist in handling the emergency are exempt from the requirements of paragraph (p)(8) if they provide an emergency action plan complying with 29 CFR 1910.38.
* * * * *

(q) (1) Emergency response plan. An emergency response plan shall be developed and implemented to handle anticipated emergencies prior to the commencement of emergency response operations. The plan shall be in writing and available for inspection and copying by employees, their representatives and OSHA personnel. Employers who will evacuate their employees from the danger area when an emergency occurs, and who do not permit any of their employees to assist in handling the emergency, are exempt from the requirements of this paragraph if they provide an emergency action plan in accordance with 29 CFR 1910.38.
* * * * *

(11) (i) (ii) Where the clean-up is done on plant property using plant or workplace employees, such employees shall have completed the training requirements of the following: 29 CFR 1910.38, 1910.134, 1910.1200, and other appropriate safety and health training made necessary by the tasks they are expected to perform such as personal protective equipment and decontamination procedures. * * *
* * * * *
Subpart L -- Fire Protection

6. The authority citation for subpart L of part 1910 is revised to read as follows:

7. In § 1910.157, paragraphs (a) and (b)(1) are revised to read as follows:

Subpart R -- Special Industries

8. The authority citation for subpart R of part 1910 is revised to read as follows:

9. In § 1910.268, paragraph (b)(1)(iii) is revised to read as follows:

1910.268 Telecommunications.
* * * * *
(b) (1) (iii) Working spaces. Maintenance aisles, or wiring aisles, between equipment frame lineups are working spaces and are not an exit route for purposes of 29 CFR 1910.34.

10.a. In § 1910.272, paragraph (d) is revised.
b. In Appendix A to § 1910.272, under the heading "2. Emergency Action Plans" the second sentence is revised. The revised text is set forth as follows:

1910.272 Grain handling facilities.
* * * * *
(d) Emergency action plan. The employer shall develop and implement an emergency action plan meeting the requirements contained in 29 CFR 1910.38.
* * * * *
Appendix A to § 1910.272 Grain Handling Facilities
* * * * *
2. Emergency Action Plan

The emergency action plan (§ 1910.38) covers those designated actions employers and employees are to take to ensure employee safety from fire and other emergencies. * * *
* * * * *
Subpart Z -- Toxic and Hazardous Substances

11. The authority citation for subpart Z of part 1910 is revised to read as follows:

12. In § 1910.1047, paragraph (h)(1)(iii) is revised to read as follows:

1910.1047 Ethylene oxide.
* * * * *
(h) (1) (iii) The plan shall include the elements prescribed in 29 CFR 1910.38 and 29 CFR 1910.39, "Emergency action plans" and "Fire prevention plans," respectively.
* * * * *
13. In § 1910.1050, paragraph (d)(1)(iii) is revised to read as follows:

1910.1050 Methylenedianiline
* * * * *
(d) (1) (iii) The plan shall specifically include provisions for alerting and evacuating affected employees as well as the elements prescribed in 29 CFR 1910.38 and 29 CFR 1910.39, "Emergency action plans" and "Fire prevention plans," respectively.
* * * * *
14. In § 1910.1051, paragraph (j) is revised to read as follows:

1910.1051 1,3-Butadiene

(j) Emergency situations. Written plan. A written plan for emergency situations shall be developed, or an existing plan shall be modified, to contain the applicable elements specified in 29 CFR 1910.38 and 29 CFR 1910.39, "Emergency action plans" and "Fire prevention plans," respectively, and in 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response," for each workplace where there is the possibility of an emergency.

1910.157 Portable fire extinguishers.

(a) Scope and application. The requirements of this section apply to the placement, use, maintenance, and testing of portable fire extinguishers provided for the use of employees. Paragraph (d) of this section does not apply to extinguishers provided for employee use on the outside of workplace buildings or structures. Where extinguishers are provided but are not intended for employee use and the employer has an emergency action plan and a fire prevention plan that meet the requirements of 29 CFR 1910.38 and 29 CFR 1910.39 respectively, then only the requirements of paragraphs (e) and (f) of this section apply.

(b) Exemptions. (1) Where the employer has established and implemented a written fire safety policy which requires the immediate and total evacuation of employees from the workplace upon the sounding of a fire alarm signal and which includes an emergency action plan and a fire prevention plan which meet the requirements of 29 CFR 1910.38 and 29 CFR 1910.39 respectively, and when extinguishers are not available in the workplace, the employer is exempt from all requirements of this section unless a specific standard in part 1910 requires that a portable fire extinguisher be provided.
*

29 CFR 1910

Subpart L

Fire Protection

1910.157 Portable Fire Extinguishers

(a) Scope and application. The requirements of this section apply to the placement, use, maintenance, and testing of portable fire extinguishers provided for the use of employees. Paragraph (d) of this section does not apply to extinguishers provided for employee use on the outside of workplace buildings or structures. Where extinguishers are provided but are not intended for employee use and the employer has an emergency action plan and a fire prevention plan which meet the requirements of 1910.38, then only the requirements of paragraphs (e) and (f) of this section apply.

(b) Exemptions. (1) Where the employer has established and implemented a written fire safety policy which requires the immediate and total evacuation of employees from the workplace upon the sounding of a fire alarm signal and which includes an emergency action plan and a fire prevention plan which meet the requirements of 1910.38, and when extinguishers are not available in the workplace, the employer is exempt from all requirements of this section unless a specific standard in Part 1910 requires that a portable fire extinguisher be provided.

(2) Where the employer has an emergency action plan meeting the requirements of 1910.38 which designates certain employees to be the only employees authorized to use the available portable fire extinguishers, and which requires all other employees in the fire area to immediately evacuate the affected work area upon the sounding of the fire alarm, the employer is exempt from the distribution requirements in paragraph (d) of this section.

(c) General requirements. (1) The employer shall provide portable fire extinguishers and shall mount, locate and identify them so that they are readily accessible to employees without subjecting the employees to possible injury.

(2) Only approved portable fire extinguishers shall be used to meet the requirements of this section.

(3) The employer shall not provide or make available in the workplace portable fire extinguishers using carbon tetrachloride or chlorobromomethane extinguishing agents

(4) The employer shall assure that portable fire extinguishers are maintained in a fully charged and operable condition and kept in their designated places at all times except during use.

(5) The employer shall remove from service all soldered or riveted shell self-generating soda acid or self-generating foam or gas cartridge water type portable fire extinguishers which are

operated by inverting the extinguisher to rupture the cartridge or to initiate an uncontrollable pressure generating chemical reaction to expel the agent.

(d) Selection and distribution. (1) Portable fire extinguishers shall be provided for employee use and selected and distributed based on the classes of anticipated workplace fires and on the size and degree of hazard which would affect their use.

(2) The employer shall distribute portable fire extinguishers for use by employees on Class A fires so that the travel distance for employees to any extinguisher is 75 feet (22.9 m) or less.

(3) The employer may use uniformly spaced standpipe systems or hose stations connected to a sprinkler system installed for emergency use by employees instead of Class A portable fire extinguishers, provided that such systems meet the respective requirements of 1910.158 or 1910.159, that they provide total coverage of the area to be protected, and that employees are trained at least annually in their use.

(4) The employer shall distribute portable fire extinguishers for use by employees on Class B fires so that the travel distance from the Class B hazard area to any extinguisher is 50 feet (15.2 m) or less.

(5) The employer shall distribute portable fire extinguishers used for Class C hazards on the basis of the appropriate pattern for the existing Class A or Class B hazards.

(6) The employer shall distribute portable fire extinguishers or other containers of Class D extinguishing agent for use by employees so that the travel distance from the combustible metal working area to any extinguishing agent is 75 feet (22.9 m) or less. Portable fire extinguishers for Class D hazards are required in those combustible metal working areas where combustible metal powders, flakes, shavings, or similarly sized products are generated at least once every two weeks.

(e) Inspection, maintenance and testing. (1) The employer shall be responsible for the inspection, maintenance and testing of all portable fire extinguishers in the workplace.

(2) Portable extinguishers or hose used in lieu thereof under paragraph (d)(3) of this section shall be visually inspected monthly.

(3) The employer shall assure that portable fire extinguishers are subjected to an annual maintenance check. Stored pressure extinguishers do not require an internal examination. The employer shall record the annual maintenance date and retain this record for one year after the last entry or the life of the shell, whichever is less. The record shall be available to the Assistant Secretary upon request.

(4) The employer shall assure that stored pressure dry chemical extinguishers that require a 12-year hydrostatic test are emptied and subjected to applicable maintenance procedures every 6 years. Dry chemical extinguishers having non-refillable disposable containers are exempt from this requirement. When recharging or hydrostatic testing is performed, the 6-year requirement begins from that date.

(5) The employer shall assure that alternate equivalent protection is provided when portable fire extinguishers are removed from service for maintenance and recharging.

(f) Hydrostatic testing. (1) The employer shall assure that hydrostatic testing is performed by trained persons with suitable testing equipment and facilities.

(2) The employer shall assure that portable extinguishers are hydrostatically tested at the intervals listed in Table L-1 of this section, except under any of the following conditions:

(i) When the unit has been repaired by soldering, welding, brazing, or use of patching compounds;

(ii) When the cylinder or shell threads are damaged;

(iii) When there is corrosion that has caused pitting, including corrosion under removable name plate assemblies;

(iv) When the extinguisher has been burned in a fire; or

(v) When a calcium chloride extinguishing agent has been used in a stainless steel shell.

(3) In addition to an external visual examination, the employer shall assure that an internal examination of cylinders and shells to be tested is made prior to the hydrostatic tests.

TABLE L-1

Type of extinguishers	Test Interval (years)
Soda acid (soldered brass shells) (until 1/1/82)	(1)
Soda acid (stainless steel shell)	5
Cartridge operated water and/or antifreeze	5
Stored pressure water and/or antifreeze	5
Wetting agent	5
Foam (soldered brass shells) (until 1/1/82)	(1)
Foam (stainless steel shell)	5
Aqueous Film Forming foam (AFFF)	5
Loaded stream	5
Dry chemical with stainless steel	5
Carbon Dioxide	5
Dry chemical, stored pressure, with mild steel, brazed brass or aluminum shells	12
Dry chemical, cartridge or cylinder operated, with mild steel shells	12
Halon 1211	12
Halon 1301	12
Dry powder, cartridge or cylinder operated with mild steel shells	12

Footnote(1) Extinguishers having shells constructed of copper or brass joined by soft solder or rivets shall not be hydrostatically tested and shall be removed from service by January 1,1982. (Not permitted)

(4) The employer shall assure that portable fire extinguishers are hydrostatically tested whenever they show new evidence of corrosion or mechanical injury, except under the conditions listed in paragraphs (f)(2)(i)-(v) of this section.

5) The employer shall assure that hydrostatic tests are performed on extinguisher hose assemblies which are equipped with a shut-off nozzle at the discharge end of the hose. The test interval shall be the same as specified for the extinguisher on which the hose is installed.

(6) The employer shall assure that carbon dioxide hose assemblies with a shutoff nozzle are hydrostatically tested at 1,250 psi (8,620 kPa).

(7) The employer shall assure that dry chemical and dry powder hose assemblies with a shut-off nozzle are hydrostatically tested at 300 psi (2,070 kpa).

(8) Hose assemblies passing a hydrostatic test do not require any type of recording or stamping.

(9) The employer shall assure that hose assemblies for carbon dioxide extinguishers that require a hydrostatic test are tested within a protective cage device.

(10) The employer shall assure that carbon dioxide extinguishers and nitrogen or carbon dioxide cylinders used with wheeled extinguishers are tested every 5 years at 5/3 of the service pressure as stamped into the cylinder. Nitrogen cylinders which comply with 49 CFR 173.34(e)(15) may be hydrostatically tested every 10 years.

(11) The employer shall assure that all stored pressure and Halon 1211 types of extinguishers are hydrostatically tested at the factory test pressure not to exceed two times the service pressure.

(12) The employer shall assure that acceptable self-generating type soda acid and foam extinguishers are tested at 350 psi (2,410 kpa).

(13) Air or gas pressure may not be used for hydrostatic testing.

(14) Extinguisher shells, cylinders, or cartridges which fail a hydrostatic pressure test, or which are not fit for testing shall be removed from service and from the workplace.

(15)(i) The equipment for testing compressed gas type cylinders shall be of the water jacket type. The equipment shall be provided with an expansion indicator which operates with an accuracy within one percent of the total expansion or icc (.lmL) of liquid.

(ii) The equipment for testing non-compressed gas type cylinders shall consist of the following:

(A) A hydrostatic test pump, hand or power operated, capable of producing not less than 150 percent of the test pressure, which shall include appropriate check valves and fittings;

(B) A flexible connection for attachment to fittings to test through the extinguisher nozzle, test bonnet, or hose outlet, as is applicable; and

(C) A protective cage or barrier for personal protection of the tester, designed to provide visual observation of the extinguisher under test.

(16) The employer shall maintain and provide upon request to the Assistant Secretary evidence that the required hydrostatic testing of fire extinguishers has been performed at the time intervals shown in Table L-1. Such evidence shall be in the form of a certification record which includes the date of the test, the signature of the person who performed the test and the serial number, or other identifier, of the fire extinguisher that was tested. Such records shall be kept until the extinguisher is hydrostatically re-tested at the time interval specified in Table L-1 or until the extinguisher is taken out of service, whichever comes first.

(g) Training and education. (1) Where the employer has provided portable fire extinguishers for employee use in the workplace, the employer shall also provide an educational program to familiarize employees with the general principles of fire extinguisher use and the hazards involved with incipient stage fire fighting.

(2) The employer shall provide the education required in paragraph (g)(1) of this section upon initial employment and at least annually thereafter.

(3) The employer shall provide employees who have been designated to use fire fighting equipment as part of an emergency action plan with training in the use of the appropriate equipment.

(4) The employer shall provide the training required in paragraph (g)(3) of this section upon initial assignment to the designated group of employees and at least annually thereafter.

[45 FR 60708, Sept. 12,1980; 46 FR 24557, May 1,1981, as amended at 51 FR 34560, Sept. 29,1986; 61 FR 9227, March 7,1996]

Subpart E –
Exit Routes, Emergency Action Plans, and Fire Prevention Plans

1910.34 Coverage and definitions.

(a) Every employer is covered

(b) Exits routes are covered. cover the minimum requirements for exit routes

1-42

(c) Definitions

Exit means that portion of an exit route that is generally separated from other areas to provide a protected way of travel to the exit discharge

Exit access means that portion of an exit route that leads to an exit.

Exit discharge means the part of the exit route that leads directly outside or to a street, walkway, refuge area, public way, or open space with access to the outside.

2- 41

(c) Definitions Cont.

Exit route means The exit access; the exit; and, the exit discharge.

High hazard area means an area inside a workplace in which operations include high hazard materials, processes, or contents.

Occupant load means the total number of persons that may occupy a workplace

3-43

1910.35 Compliance with NFPA 101-2000, Life Safety Code.

An employer who demonstrates compliance with the exit route provisions of NFPA 101-2000, the Life Safety Code, will be deemed to be in compliance

4-43

1910.36 Design and construction requirements for exit routes

(a)Basic requirements. Exit routes must meet the following

(1) An exit route must be permanent.

(2) An exit must be separated by fire resistant materials

5-43

(3) Openings into an exit must be limited. An opening into an exit must be protected by a self-closing fire door that remains closed or automatically closes

6-44

1910.36 Cont.

(b) The number of exit routes must be adequate.

(1)Two exit routes. At least two exit routes must be available in a workplace

(2) More than two exit routes. More than two exit routes must be available in a workplace if the number of employees, the size of the building, its occupancy, or the arrangement of the workplace is such that all employees would not be able to evacuate safely during an emergency.

7-44

1910.36 Cont.

(c) Exit discharge.

(1)Each exit discharge must lead directly outside or to a street, walkway, refuge area, public way, or open space with access to the outside.

(2) The street, must be large enough to accommodate the building occupants

(3) Exit stairs that continue beyond the level on which the exit discharge is located must be interrupted at that level by doors,

8-44

1910.36 Cont.

(d) An exit door must be unlocked

(1)Employees must be able to open an exit door from the inside without keys, tools, or special knowledge. A device such as a panic bar that locks only from the outside is permitted on exit discharge doors.

(2) Exit route doors must be free of any device or alarm that could restrict emergency use of the exit route if the device or alarm fails.

9-45

1910.36 Cont.

(e) A side-hinged exit door must be used.

(2) The door that connects any room to an exit route must swing out in the direction of exit travel if the room is designed to be occupied by more than 50 people or if the room is a high hazard area

10-45

(f) The capacity of an exit route must be adequate.

(2) The capacity of an exit route may not decrease in size

11-45

1910.36 Cont.

(g) An exit route must meet minimum height and width requirements.

(1)The ceiling of an exit route must be at least seven feet six inches high. Any projection from the ceiling must not reach a point less than six feet eight inches from the floor.

(2) An exit access must be at least 28 inches wide at all points.

12-45

(3) The width of an exit route must be sufficient

(4) Objects that project into the exit route must not reduce the width of the exit route

13-45

1910.36 Cont.

(h) An outdoor exit route must meet the minimum height and width requirements and must also meet the following requirements:

(1)The outdoor exit route must have guardrails to protect unenclosed sides if a fall hazard exists;

(2) The outdoor exit route must be covered if snow or ice is likely to accumulate

14-46

(3) The outdoor exit route must be smooth

(4) The outdoor exit route must not have a dead- end that is longer than 20 feet

15-46

1910.37 Maintenance, safeguards, and operational features for exit routes

(a)The danger to employees must be minimized.

(1) Exit routes must be kept free of explosive or highly flammable furnishings or other decorations

(2) Exit routes must not have to travel toward a high hazard area

16-46

1910.37 (a) Cont.

(3) Exit routes must be free and unobstructed. No materials or equipment may be placed, either permanently or temporarily, within the exit route. The exit access must not go through a room that can be locked, such as a bathroom, to reach an exit or exit discharge, nor may it lead into a dead-end corridor. Stairs or a ramp must be provided where the exit route is not substantially level.

17-46

1910.37

(b) Lighting and marking must be adequate and appropriate.

(1) Each exit route must be adequately lighted

(2) Each exit must be clearly visible and marked by a sign reading "Exit."

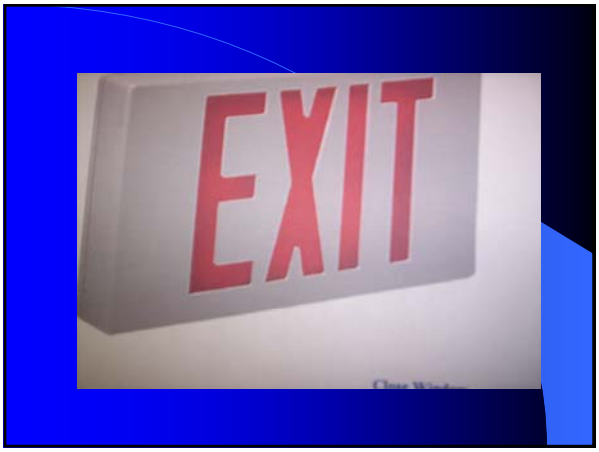
(3) Each exit route door must be free of decorations or signs

18-46

(4) If the direction of travel to the exit is not immediately apparent, signs must be posted indicating the direction of travel to the nearest exit

(5) Each doorway or passage along an exit access that could be mistaken for an exit must be marked "Not an Exit"

19-47



1910.37 (b)

(6) Each exit sign must be illuminated

(7) Each exit sign must have the word "Exit"

(d) Exit routes must be maintained during construction, repairs, or alterations.

20-47

1910.37

(e) An employee alarm system must be operable. Employers must install and maintain an operable employee alarm system that has a distinctive signal to warn employees of fire or other emergencies, unless employees can promptly see or smell a fire or other hazard in time to provide adequate warning to them. The employee alarm system must comply with § 1910.165.

21-47

1910.38 Emergency action plans.

(a) An employer must have an emergency action plan

(b) Written and oral emergency action plans. An emergency action plan must be in writing

22-47

1910 .38

The emergency action plan should address emergencies that the employer may reasonably expect in the workplace.
Examples are: fire; toxic chemical releases; hurricanes; tornadoes; blizzards; floods; and others.

23-

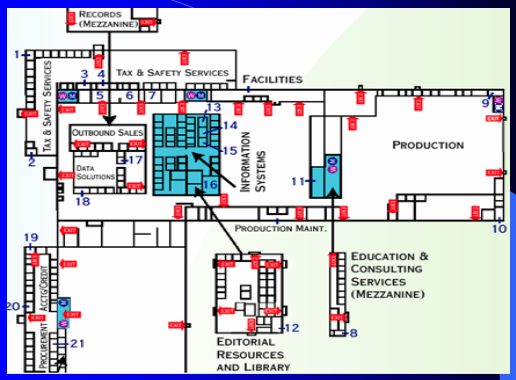
1910 .38

The use of floor plans or workplace maps

Which clearly show the emergency escape routes should be included in the emergency action plan.

Color coding will aid employees in determining their route assignments.

24-



1910.38

(c) Minimum elements of an emergency action plan

(1) Procedures for reporting

(2) Procedures for emergency evacuation

(3) Procedures to be followed by employees who remain to operate critical plant operations before they evacuate;

25-47

(3) The employer should list in detail the procedures to be taken by those employees who have been selected to remain behind to Care For Essential Plant Operations until their evacuation becomes absolutely necessary.

26-

(3) Essential plant operations may include

Monitoring of plant

Power supplies,

Water supplies,

and

Other essential services which cannot be shut down

for every Emergency Alarm

27-

(4) Procedures to account for all employees

(5) Procedures to performing rescue or medical duties; and

(6) The name or job title of every employee

28-48

1910.38

(d) Employee alarm system. An employer must have and maintain an employee alarm system. The employee alarm system must use a distinctive signal for each purpose

(e) Training. An employer must designate and train employees to assist in a safe and orderly evacuation of other employees.

At the time of an emergency, employees should know what type of evacuation is necessary and what their role is in carrying out the plan.

(f) Review of emergency action plan.

29-48

1910.38

- Stark County Reverse 911 calls
- Note: If you do not have a person answering the phone.
- Then you need to contact the County Emergency Disaster Preparedness Center and give them a direct phone line to call.

1910.38

- Emergency Phone Numbers
  - Fire, Police, State Highway Patrol, Sheriff, FBI, FEMA,
  - Medical
  - Ambulance, Hospital, Poison Control, NIOSH, Public Health Department, CDC,
  - Utilities
  - Gas, Power, Telephone, Water, Sewer

1910.38 Emergency Phone Numbers (Cont.)

- Emergency Phone Numbers (Cont.)
- Corporate Headquarters or CEO Phone #
- Public Relations Person
- Safety Person Phone Number
- Insurance Company
- Current Phone Numbers For Employee Family Contact

1910.38 Emergency Phone Numbers (Cont.)

- Contractors
  - Plumbing
  - Heating
  - Electrical
  - Heating (temporary)
  - Sprinkler Systems
  - Hazardous Material Clean up Response
  - Bus Service

1910.39 Fire prevention plans.

(a)Application. An employer must have a fire prevention plan

(b) Written and oral fire prevention plans. A fire prevention plan must be in writing, be kept in the workplace, and be made available to employees for review.

30-48

1910.39

(c) Minimum elements of a fire prevention plan

(1) A list of all major fire hazards. The type of fire protection equipment necessary to control each hazard;

(2) Procedures to control accumulations of flammable and combustible waste materials

31-48

(4) The name or job title of employees responsible for maintaining equipment

(5) The name or job title of employees responsible for the control of fuel source hazards

32-49

1910.157 Portable fire extinguishers.

(a) Scope and application. The requirements of this section apply to the placement, use, maintenance, and testing of portable fire extinguishers provided for the use of employees.

33-52

1910.157 (a)

Where extinguishers are provided but are not intended for employee use and the employer has an emergency action plan stating
"All employees are to evacuate the facility"

34-52

1910.157 (c)

(1)The employer shall provide portable fire extinguishers and shall mount, locate and identify them so that they are readily accessible to employees without subjecting the employees to possible injury.

(2)Only approved portable fire extinguishers shall be used

35-52

1910.157 (c)

(4)The employer shall assure that portable fire extinguishers are maintained in a fully charged and operable condition and kept in their designated places at all times except during use.

36-52

Definitions

"Class A fire" means a fire involving ordinary combustible materials such as paper, wood, cloth, and some rubber and plastic materials.

"Class B fire" means a fire involving flammable or combustible liquids, flammable gases, greases and similar materials, and some rubber and plastic materials.

37-

Definitions

"Class C fire" means a fire involving energized electrical equipment where safety to the employee requires the use of electrically nonconductive extinguishing media.

"Class D fire" means a fire involving combustible metals such as magnesium, titanium, zirconium, sodium, lithium and potassium.

38-

1910.157 (d)

(1)Portable fire extinguishers shall be provided for employee use and selected and distributed based on the classes

Class A fires so that the travel distance for employees to any extinguisher is 75 feet or less.

Class B hazard area to any extinguisher is 50 feet or less.

Class D hazard area to any extinguisher is 75 feet or less

39-53

(e) Inspection, maintenance and testing.

(2) Portable extinguishers or hose shall be **visually inspected monthly**
(3) The employer shall record the **annual** maintenance date and retain this record for one year after the last entry
(4) **Hydrostatic test** are emptied and subjected to applicable maintenance procedures every **6 years**

40-53

Training and Education.

Where the employer has provided portable fire extinguishers for employee use in the workplace, the employer shall also provide an educational program to familiarize employees with the general principles of fire extinguisher use and the hazards involved with incipient stage fire fighting.

The employer shall provide the **training required annually**

41-56

Zach Takes His Training Seriously


Zach His Head Over Heels

FLAMMABLE AND COMBUSTIBLE LIQUIDS - 1910.106

Definitions

Flammable (Explosive) Limits

Containers and Portable Tanks

Storage Cabinets

Inside Storage Rooms

Storage Inside Buildings

Fire Control

Handling Liquids at Point of Final Use

Reference:
29 CFR 1910.106, *Flammable and Combustible Liquids*

Additional Sources of Information:
National Fire Protection Association (NFPA)
Underwriters Laboratories (UL)

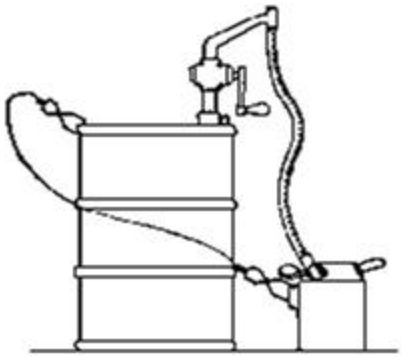
Discussion/Overheads - 2.32 MB

Student Handouts - 205 KB

Self-Inspection Checklist

FLAMMABLE AND COMBUSTIBLE LIQUIDS - 1910.106

Introduction



The primary basis of this standard is the National Fire Protection Association's publication NFPA 30, *Flammable and Combustible Liquids Code*. This standard applies to the handling, storage, and use of flammable and combustible liquids with a flash point below 200°F. There are two primary hazards associated with flammable and combustible liquids: explosion and fire. In order to prevent these hazards, this standard addresses the primary concerns of: design and construction, ventilation, ignition sources, and storage.

Definitions

There are a number of definitions included in 1910.106. These definitions were derived from consensus standards, and were not uniquely developed for OSHA regulations. Some of the more important definitions are discussed below.

Aerosol shall mean a material which is dispensed from its container as a mist, spray, or foam by a propellant under pressure.

Approved shall mean approved or listed by a nationally recognized testing laboratory.

Boiling point shall mean the boiling point of a liquid at a pressure of 14.7 pounds per square inch absolute (psia). This pressure is equivalent to 760 millimeters of mercury (760 mm Hg).

At temperatures above the boiling point, the pressure of the atmosphere can no longer hold the liquid in the liquid state and bubbles begin to form. The lower the boiling point, the greater the vapor pressure at normal ambient temperatures and consequently the greater the fire risk.

Container shall mean any can, barrel, or drum.

Closed container shall mean a container so sealed by means of a lid or

other device that neither liquid nor vapor will escape from it at ordinary temperatures.

Fire area shall mean an area of a building separated from the remainder of the building by construction having a fire resistance of at least 1 hour and having all communicating openings properly protected by an assembly having a fire resistance rating of at least 1 hour.

Flash point means the minimum temperature at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid. The flash point is normally an indication of susceptibility to ignition.

The flash point is determined by heating the liquid in test equipment and measuring the temperature at which a flash will be obtained when a small flame is introduced in the vapor zone above the surface of the liquid.

A standard closed container is used to determine the closed-cup flash point and a standard open-surface dish for the open-cup flash point temperature, as specified by the American Society for Testing and Materials (ASTM). These methods are referenced in OSHA's 1910.106 standard.

Combustible liquid means any liquid having a flash point at or above 100ºF (37.8ºC). Combustible liquids shall be divided into two classes as follows:

> *Class II liquids* shall include those with flash points at or above 100ºF (37.8ºC) and below 140ºF (60ºC), except any mixture having components with flash points of 200ºF (93.3ºC) or higher, the volume of which make up 99 percent or more of the total volume of the mixture.
>
> *Class III liquids* shall include those with flash points at or above 140ºF (60ºC). Class III liquids are subdivided into two subclasses:
>
> > *Class IIIA liquids* shall include those with flash points at or above 140ºF (60ºC) and below 200ºF (93.3ºC), except any mixture having components with flash points of 200ºF (93.3ºC), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.
> >
> > *Class IIIB liquids* shall include those with flash points at or

IIIB liquids. Where the term "Class III liquids" is used in this section, it shall mean only Class IIIA liquids.

When a combustible liquid is heated to within 30°F (16.7°C) of its flash point, it shall be handled in accordance with the requirements for the next lower class of liquids.

Flammable liquid means any liquid having a flash point below 100°F (37.8°C) or higher, the total of which make up 99 percent or more of the total volume of the mixture. Flammable liquids shall be known as Class I liquids. Class I liquids are divided into three classes as follows:

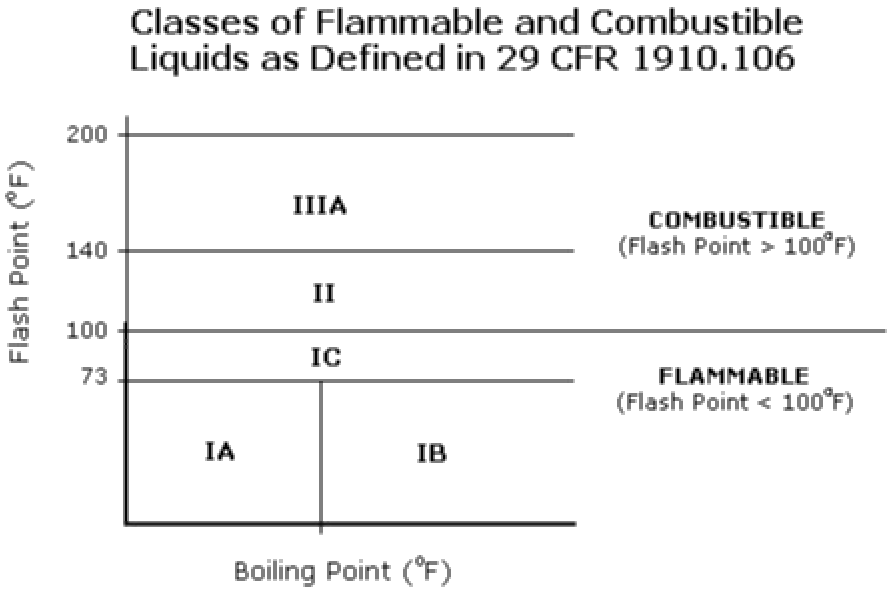
Class IA shall include liquids having flash points below 73°F (22.8°C) and having a boiling point below 100°F (37.8°C).

Class IB shall include liquids having flash points below 73°F (22.8°C) and having a boiling point at or above 100°F (37.8°C).

Class IC shall include liquids having flash points at or above 73°F (22.8°C) and below 100°F (37.8°C).

It should be mentioned that flash point was selected as the basis for classification of flammable and combustible liquids because it is directly related to a liquid's ability to generate vapor, i.e., its volatility. Since it is the vapor of the liquid, not the liquid itself, that burns, vapor generation becomes the primary factor in determining the fire hazard. The expression "low flash - high hazard" applies. Liquids having flash points below ambient storage temperatures generally display a rapid rate of flame spread over the surface of the liquid, since it is not necessary for the heat of the fire to expend its energy in heating the liquid to generate more vapor.

The above definitions for classification of flammable and combustible liquids are quite complex. The diagram below should aid in their understanding.



Portable tank shall mean a closed container having a liquid capacity over 60 U.S. gallons and not intended for fixed installation.

Safety can shall mean an approved container, of not more than 5 gallons capacity, having a spring-closing lid and spout cover and so designed that it will safely relieve internal pressure when subjected to fire exposure.

Vapor pressure shall mean the pressure, measured in pounds per square inch (absolute) exerted by a volatile liquid as determined by the *Standard Method of Test for Vapor Pressure of Petroleum Products (Reid Method)*, American Society for Testing and Materials ASTM D323-68.

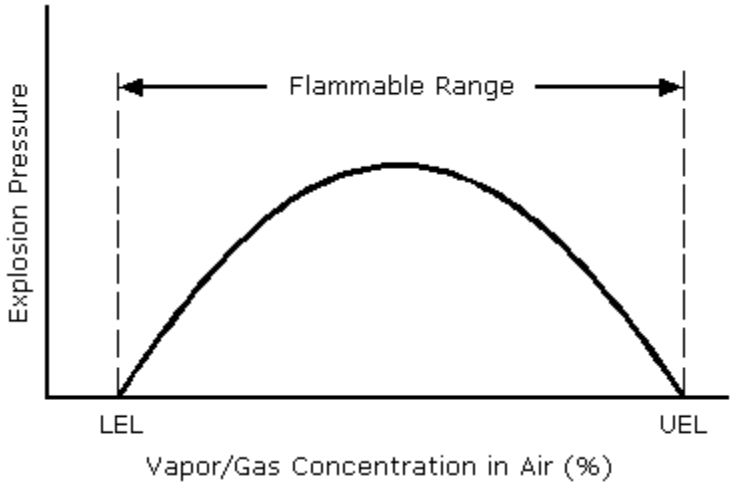
Vapor pressure is a measure of a liquid's propensity to evaporate. The higher the vapor pressure, the more volatile the liquid and, thus, the more readily the liquid gives off vapors.

Ventilation as specified in this section is for the prevention of fire and explosion. It is considered adequate if it is sufficient to prevent accumulation of significant quantities of vapor-air mixtures in concentration over one-fourth of the lower flammable limit.

Flammable (Explosive) Limits

When vapors of a flammable or combustible liquid are mixed with air in the proper proportions in the presence of a source of ignition, rapid combustion or an explosion can occur. The proper proportion is called the

flammable range and is also often referred to as the *explosive range*. The flammable range includes all concentrations of flammable vapor or gas in air, in which a flash will occur or a flame will travel if the mixture is ignited. There is a minimum concentration of vapor or gas in air below which propagation of flame does not occur on contact with a source of ignition. There is also a maximum proportion of vapor in air above which propagation of flame does not occur. These boundary-line mixtures of vapor with air are known as the *lower* and *upper flammable* or *explosive limits* (LEL or UEL) respectively, and they are usually expressed in terms of percentage by volume of vapor in air. See figure below.



In popular jargon, a vapor/air mixture below the flammable limit is too "lean" to burn or explode, and a mixture above the upper flammable limit is too "rich" to burn or explode. No attempt is made to differentiate between the terms *flammable* and *explosive* as applied to the lower and upper limits of flammability.

Container and Portable Tank Storage

Scope

This section applies only to the storage of flammable or combustible liquids in drums or other containers (including flammable aerosols) not exceeding 60 gallons individual capacity and portable tanks of less than 660 gallon individual capacity. A portable tank is a closed container which has a liquid capacity of over 60 gallons and is not intended for fixed installations.

This section does not apply to the following:

- Storage of containers in bulk plants, service stations, refineries,

chemical plants, and distilleries;

- Class I or Class II liquids in the fuel tanks of a motor vehicle, aircraft, boat, or portable or stationary engine;
- Flammable or combustible paints, oils, varnishes, and similar mixtures used for painting or maintenance when not kept for a period in excess of 30 days;
- Beverages when packed in individual containers not exceeding 1 gallon in size.

Design, Construction, and Capacity of Containers

Only approved containers and portable tanks may be used to store flammable and combustible liquids. Metal containers and portable tanks meeting the requirements of the Department of Transportation (DOT) (49 CFR 178) are deemed acceptable when containing products authorized by the DOT (49 CFR 173).

The latest version of NFPA 30, *Flammable and Combustible Liquids Code*, indicates that certain petroleum products may be safely stored within plastic containers if the terms and conditions of the following specifications are met:

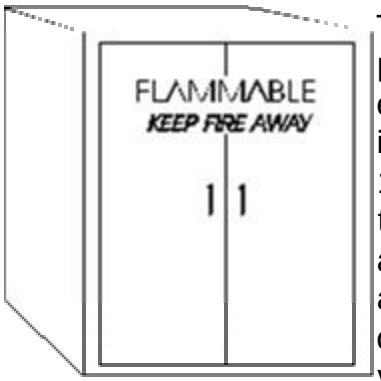
(a) ANSI/ASTM D 3435-80, *Plastic Containers (Jerry Cans) for Petroleum Products*.

(b) ASTM F 852-86, *Standard for Portable Gasoline Containers for Consumer Use*.

(c) ASTM F 976-86, *Standard for Portable Kerosine Containers for Consumer Use*.

(d) ANSI/UL 1313-83, *Nonmetallic Safety Cans for Petroleum Products*.

This information was found July 2002 at
http://www.osha-slc.gov/SLTC/smallbusiness/sec8.html



This standard also requires portable tanks to have provision for emergency venting. Top-mounted emergency vents must be capable of limiting internal pressure under fire exposure conditions to 10 psig or 30 percent of the bursting pressure of the tank, whichever is greater. Portable tanks are also required to have at least one pressure-activated vent with a minimum capacity of 6,000 cubic feet of free air at 14.7 psia and 60°F. These vents must be set to open at not less than 5 psig. If fusible vents are used, they shall be actuated by elements that operate at a temperature not exceeding 300°F.

Maximum allowable sizes of various types of containers and portable tanks are specified based on the class of flammable and combustible liquid they contain.

Design, Construction and Capacity of Storage Cabinets

Not more than 60 gallons of Class I and/or Class II liquids, or not more than 120 gallons of Class III liquids may be stored in an individual cabinet.

This standard permits both metal and wooden storage cabinets. Storage cabinets shall be designed and constructed to limit the internal temperature to not more than 325°F when subjected to a standardized 10-minute fire test. All joints and seams shall remain tight and the door shall remain securely closed during the fire test. Storage cabinets shall be conspicuously labeled, "Flammable - Keep Fire Away."

The bottom, top, door, and sides of metal cabinets shall be at least No. 18 gage sheet metal and double walled with 1½-inch air space. The door shall be provided with a three-point lock, and the door sill shall be raised at least 2 inches above the bottom of the cabinet.

Design and Construction of Inside Storage Rooms

Construction

Construction is to comply with the test specifications included in NFPA 251-1969, *Standard Methods of Fire Tests of Building Construction and Materials*.

Openings to other rooms or buildings shall be provided with non-combustible liquid-tight raised sills or ramps at least 4 inches in height, or the floor in the storage area shall be at least 4 inches below the

surrounding floor. Openings shall be provided with approved self-closing fire doors. The room shall be liquid-tight where the walls join the floor. A permissible alternate to the sill or ramp is an open-grated trench inside of the room which drains to a safe location. This method may be preferred if there is an extensive need to transfer flammable liquids into and out of the room by means of hand trucks.

Rating and Capacity

Storage in inside storage rooms shall comply with the following:

STORAGE IN INSIDE ROOMS

Fire Protection Provided[1]	Fire Resistance	Maximum Floor Area (ft^2)	Total Allowable Quantities (gal/ft^2 floor area)
Yes	2 hr.	500	10
No	2 hr.	500	4*
Yes	1 hr.	150	5*
No	1 hr.	150	2

* NOTE: These numbers are incorrectly shown in 29 CFR 1910.106.

FOOTNOTE(1) Fire protection system shall be sprinkler, water spray, carbon dioxide, or other system.

Wiring

Electrical wiring and equipment located in inside storage rooms used for Class I liquids shall be approved under Subpart S, Electrical, for Class I, Division 2 Hazardous Locations; for Class II and Class III liquids, shall be approved for general use.

Ventilation

Every inside storage room shall be provided with either a gravity or a mechanical exhaust ventilation system designed to provide for a complete change of air within the room at least six times per hour. Ventilation is vital to the prevention of flammable liquid fires and explosions. It is important to ensure that air flow through the system is constant and prevents the accumulation of any flammable vapors.

Storage
In every inside storage room, there shall be maintained an aisle at least 3 feet wide. Easy movement within the room is necessary in order to reduce the potential for spilling or damaging the containers and to provide both access for fire fighting and a ready escape path for occupants of the room, should a fire occur.

Containers over 30 gallons capacity shall not be stacked one upon the other. Such containers are built to DOT specifications and are not required to withstand a drop test greater than 3 feet when full.

Dispensing shall be only by approved pump or self-closing faucet.

Storage Inside Buildings

Egress
Flammable or combustible liquids, including stock for sale, shall not be stored so as to limit use of exits, stairways, or areas normally used for the safe egress of people.

Office Occupancies
Storage shall be prohibited except that which is required for maintenance and operation of equipment. Such storage shall be kept in closed metal containers stored in a storage cabinet or in safety cans or in an inside storage room not having a door that opens into that portion of the building used by the public.

General Purpose Public Warehouses
There are tables in the standard summarizing the storage requirements applicable to "General Purpose Public Warehouses." These tables refer to indoor storage of flammable and combustible liquids which are confined in containers and portable tanks. Storage of incompatible materials that create a fire exposure (e.g., oxidizers, water-reactive chemicals, certain acids and other chemicals) is not permitted.

Warehouses or Storage Buildings
The last type of inside storage covered by this paragraph addresses storage in "warehouses or storage buildings." These structures are sometimes referred to as outside storage rooms. Practically any quantity of flammable and combustible liquid can be stored in these buildings provided that they are stored in a configuration consistent with the tables in this paragraph.

Containers in piles shall be separated by pallets or dunnage where necessary to provide stability and to prevent excessive stress on

container walls.

Stored material shall not be piled within 3 feet of beams or girders and shall be at least 3 feet below sprinkler deflectors or discharge orifices of water spray, or other fire protection equipment.

Aisles of at least 3 feet in width shall be maintained to access doors, windows or standpipe connections.

Storage Outside Buildings

Requirements covering "storage outside buildings" are summarized in tables in this paragraph. Associated requirements are given for storage adjacent to buildings. Also included are requirements involving controls for diversion of spills away from buildings and security measures for protection against trespassing and tampering. Certain housekeeping requirements are given which relate to control of weeds, debris and accumulation of unnecessary combustibles.

Fire Control

Suitable fire control devices, such as small hose or portable fire extinguishers, shall be available at locations where flammable or combustible liquids are stored.

At least one portable fire extinguisher having a rating of not less than 12-B units shall be located:

- outside of, but not more than 10 feet from, the door opening into any room used for storage; and
- not less than 10 feet, nor more than 25 feet, from any Class I or Class II liquid storage area located outside of a storage room but inside a building.

The reason for requiring that portable fire extinguishers be located a distance away from the storage room is that fires involving Class I and Class II flammable liquids are likely to escalate rapidly. If the fire is too close to the storage area, it may be impossible to get to it once the fire has started.

Open flames and smoking shall not be permitted in flammable or combustible liquid storage areas.

Materials which react with water shall not be stored in the same room with flammable or combustible liquids. Many flammable and combustible liquid storage areas are protected by automatic sprinkler or water spray

systems and hose lines. Consequently, any storage of water-reactive material in the storage area creates an unreasonable risk.

Industrial Plants

Scope
This paragraph applies to those industrial plants where:

- the use of flammable or combustible liquids is incidental to the principal business; or
- where flammable or combustible liquids are handled or used only in unit physical operations such as mixing, drying, evaporating, filtering, distillation, and similar operations which do not involve chemical reaction.

This paragraph shall not apply to chemical plants, refineries or distilleries.

Incidental Storage or Use of Flammable or Combustible Liquids

Application
This subparagraph is applicable to those portions of an industrial plant where the use and handling of flammable or combustible liquids is only incidental to the principal business, such as paint thinner storage in an automobile assembly plant, solvents used in the construction of electronic equipment, and flammable finishing materials used in furniture manufacturing.

Containers
Flammable or combustible liquids shall be stored in tanks or closed containers.

The quantity of liquid that may be located outside of an inside storage room or storage cabinet in a building or in any one fire area of a building shall not exceed:

- 25 gallons of Class IA liquids in containers
- 120 gallons of Class IB, IC, II, or III liquids in containers
- 660 gallons of Class 1B, 1C, II, or III liquids in a single portable tank.

Handling Liquids at Point of Final Use
Flammable liquids shall be kept in covered containers when not actually in use.

Where flammable or combustible liquids are used or handled, except in closed containers, means shall be provided to dispose promptly and safely of leakage or spills.

Flammable or combustible liquids shall be drawn from or transferred into vessels, containers, or portable tanks within a building only in the following manner:

(1) Through a closed piping system,

(2) From safety cans,

(3) By means of a device drawing through the top, or

(4) From containers or portable tanks by gravity through an approved self-closing valve.

Transfer operations must be provided with adequate ventilation. Sources of ignition are not permitted in areas where flammable vapors may travel.

Transferring liquids by means of air pressure on the container or portable tanks is prohibited. This may result in an overpressure which could exceed what the container or tank could withstand. In addition, a flammable atmosphere could be created within the container or tank. This atmosphere would be particularly sensitive to ignition because of the increased pressure.

Flammable and Combustible Liquids - §1910.106(a)

(18) ***Combustible liquid*** means any liquid having a flashpoint at or above 100°F (37.8°C). Combustible liquids shall be divided into two classes as follows:

(i) *Class II liquids* shall include those with flashpoints at or above 100°F (37.8°C) and below 140°F (60°C), except any mixture having components with flashpoints of 200°F (93.3°C) or higher, the volume of which make up 99 percent or more of the total volume of the mixture.

(ii) *Class III liquids* shall include those with flashpoints at or above 140°F (60°C). Class III liquids are subdivided into two subclasses:

(a) Class IIIA liquids shall include those with flashpoints at or above 140°F (60°C) and below 200°F (93.3°C), except any mixture

having components with flashpoints of 200°F (93.3°C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

(b) Class IIIB liquids shall include those with flashpoints at or above 200°F (93.3°C). This section does not cover Class IIIB liquids. Where the term "Class III liquids" is used in this section, it shall mean only Class IIIA liquids.

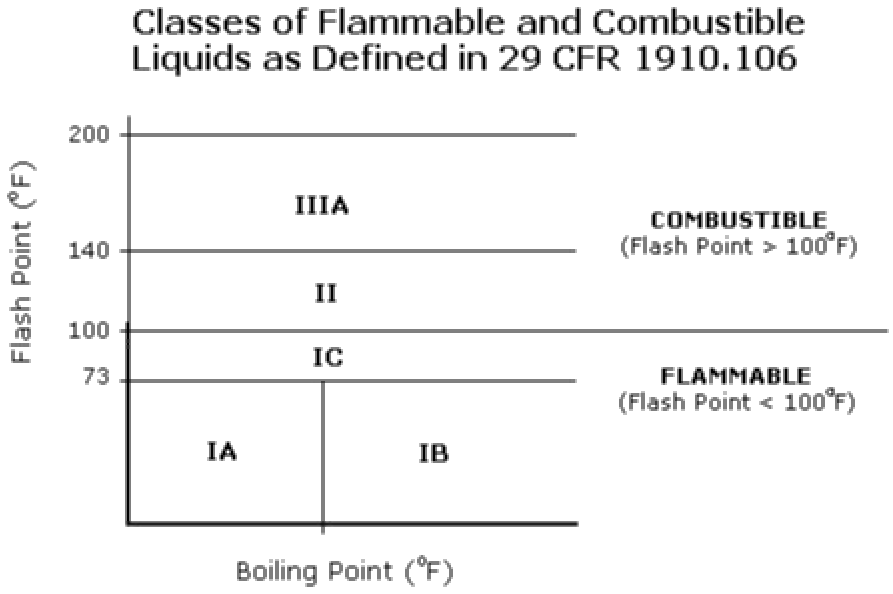
(iii) When a combustible liquid is heated for use to within 300°F (16.7°C) of its flashpoint, it shall be handled in accordance with the requirements for the next lower class of liquids.

(19) Flammable liquid means any liquid having a flashpoint below 100°F (37.8°C), except any mixture having components with flashpoints of 100°F (37.8°C) or higher, the total of which make up 99 percent or more of the total volume of the mixture. Flammable liquids shall be known as Class I liquids. Class I liquids are divided into three classes as follows:

(i) Class IA shall include liquids having flashpoints below 73°F (22.8°C) and having a boiling point below 100°F (37.8°C).

(ii) Class IB shall include liquids having flashpoints below 73°F (22.8°C) and having a boiling point at or above 100°F (37.8°C).

(iii) Class IC shall include liquids having flashpoints at or above 73°F (22.8°C) and below 100°F (37.8°C).



FLASH POINT -- the lowest temperature at which a flammable liquid will give off enough vapors to form an ignitable mixture with the air above the surface of the liquid or within its container.

LOWER FLAMMABLE LIMIT -- the percentage of vapor in the air below which a fire can't occur because there isn't enough fuel: the mixture is said to be too lean.

UPPER FLAMMABLE LIMIT -- the percentage of vapor in the air above which there isn't enough air for a fire: the mixture is said to be too rich.

VAPOR DENSITY -- the weight of a flammable vapor compared to air. (Air = 1). Vapors with a high density are more dangerous and require better ventilation because thay tend to flow along the floor and collect in low spots.

PEL -- the Permissible Exposure Limit of the vapor according to OSHA standards, expressed in parts of vapor per million parts of contaminated air. The PEL is listed because many of these substances present inhalation as well as fire hazards.

Classes of Some Flammable Liquids
Class IA

Liquid		Flash Point (°F)	Boiling Point (°F)	Flammable Limits		Vapor Density Air = 1	PEL (ppm)
Common Name	Other Names			LEL	UEL		
1-1 Dichloroethylene	Vinylidene chloride	0	99	7.3	10.0	3.4	-
Ethylamine		<0	63	3.5	14.0	1.6	10
Ethyl Chloride	Chloroethane	-58	54	3.8	15.4	2.2	1000
Ethyl Ether	Ether	-49	95	1.9	36.0	2.6	400
Isopentane		<-60	82	1.4	7.6	2.5	-
Isopropyl Chloride	2-Chloropropane	-26	97	2.8	10.7	2.7	-
Methyl Formate		-2	90	5.0	23.0	2.1	100
Pentane		<-40	97	1.5	7.8	2.5	1000
Propylene Oxide		-35	93	2.8	37.0	2.0	100

Class IB

Liquid		Flash Point (°F)	Boiling Point (°F)	Flammable Limits		Vapor Density Air = 1	PEL (ppm)
Common Name	Other Names			LEL	UEL		
Acetone		0	134	2.6	12.8	2.0	1000
Benzene	Benzol	12	176	1.3	7.1	2.8	1
Carbon Disulfide	Carbon bisulfide	-22	115	1.3	50.0	2.6	20
1,2-Dichloroethylene	Acetylene dichloride	43	140	9.7	12.8	3.4	200
Ethyl Acetate		24	171	2.2	11.0	3.0	400
Ethyl Alcohol	Ethanol, Grain alcohol	55	173	3.3	19	1.6	1000
Ethyl Benzene		59	277	1.0	6.7	3.7	100
Gasoline		-45	100-399	1.4	7.6	3-4	-
Hexane		-7	156	1.1	7.5	3.0	500
Methyl Acetate		14	135	3.1	16	2.6	200
Methyl Alcohol	Wood alcohol, Methanol	52	147	6.7	3.6	1.1	200
Methyl Ethyl Ketone	MEK, 2-Butanone	21	176	1.8	10	2.5	200
Methyl Propyl Ketone	2-Pentanone	45	216	1.5	8.2	2.9	200
VM&P Naphtha	76 Naphtha	20-45	212-320	0.9	6.0	4.2	-
Octane		56	257	1.0	6.5	3.9	500
Propyl Acetate		58	215	2.0	8.0	3.5	200
Isopropyl		40	192	1.8	8.0	3.5	250

Acetate							
Isopropyl Alcohol	IPA, 2-propanol	53	180	2.0	12	2.1	400
Toluene	Toluol	40	232	1.2	7.1	3.1	200
Butyl Acetate		72	260	1.7	7.6	4.0	150

Class IC

Liquid		Flash Point (°F)	Boiling Point (°F)	Flammable Limits		Vapor Density Air = 1	PEL (ppm)
Common Name	Other Names			LEL	UEL		
Isoamyyyl Acetate	Banana Oil	77	288	1.0	7.5	4.5	100
Amyl Alcohol	Pentanol	91	281	1.2	10	3.0	
Butyl	Butanol	84	243	1.4	11.2	2.6	100
Methyl Isobutyl Ketone	MIBK, Hexone	73	246	1.4	7.5	3.5	100
Naphtha (Petroleum)	Mineral Spirits, Petroleum Ether	85-110	302-399	0.8	6.0	4.2	-
Propyl Alcohol	Propanol	77	208	2.1	13.5	2.1	200
Styrene (Monomer)	Vinyl Benzene	90	295	1.1	6.1	3.6	100
Turpentine		95	307-347	0.8	-	-	100
Xylene	Xylol	81-115	281-291	1.1	7.0	3.7	100

Class II

Liquid		Flash Point (°F)	Boiling Point (°F)	Flammable Limits		Vapor Density Air = 1	PEL (ppm)
Common	Other Names			LEL	UEL		

Name							
Isoamyl		109	268	1.2	-	3.0	100
Cellosolve Acetate	2-Ethoxyethyl acetate	117	313	1.7	-	4.7	100
Cyclohexanone		111	313	-	-	3.4	50
Fuel Oil #1 & #2		100+	-	-	-	-	-
Fuel Oil #4		110+	-	-	-	-	-
Fuel Oil #5		130+	-	-	-	-	-
Kerosene		110-150	180-300	0.7	5.0	4.5	-
Naphtha (coal tar)		100-110	300-400	-	-	4.3	100
Naphtha (High Flash)	100 Naptha Safety Solvent, Stoddard Solvent	100-110	300-400	0.8	6.0	>4.2	500
Methyl Cellosolve	2-Methoxyethanol	115	255	2.5	14.0	-	25

Class III

Liquid		Flash Point (°F)	Boiling Point (°F)	Flammable Limits		Vapor Density Air = 1	PEL (ppm)
Common Name	Other Names			LEL	UEL		
Aniline		158	363	1.3	-	3.2	5
Butyl Cellosolve	2-Butoxyethanol	160	340	1.1	10.6	4.1	50
Cellosolve Solvent	2-Ethozyethanol Cellosolve Solvent	202	275	1.8	14.0	3.1	200
Cyclohexanol		162	322	-	-	2.5	50
Ethylene Glycol	Glycol	232	387	3.2	-	-	-
Furfural		140	324	2.1	19.3	3.3	5

Glycerine	Glycerol	320	554	-	-	3.2	-
Isophorone		184	419	0.8	3.8	-	25
Nitrobenzene		190	412	-	-	4.3	1

Non-Flammable Liquids(*)

Liquid		Boiling Point (°F)	PEL (ppm)
Common Name	**Other Names**		
Carbon Tetrachloride		171	10
Chloroform	Trichloromethane	142	50
Ethylene Dibromide	1,2-Dibromoethane	270	20
Methyl Chloroform	1,1,1-Trichloroethane	165	350
Methylene Chloride	Dichloromethane	104	500
Perchloroethylene	Tetrachloroethylene	248	100
Trichloroethylene	TCE, Trichlor	190	100

* Non-flammable under normal conditions. Unstabilized trichloroethylene can decompose violently in presence of fine aluminum powder.

Discussion/Overheads - 2.32 MB

Student Handouts - 205 KB

Self-Inspection Checklist

This information was found July 2002 at
http://www.osha-slc.gov/SLTC/smallbusiness/sec8.html

Standard Interpretations

11/04/1976 - Clarification Paint Spray Booth and Spray Areas.

Standard Interpretations - Table of Contents

• **Standard Number:** 1910.94; 1910.107; 1910.308

November 4, 1976

OSHA/Technical Support

Clarification Paint Spray Booth & Spray Areas

All Area Directors

There appears to be some confusion as to the application of 1910.94, 1910.107 and 1910.308 and 309 to paint spray operations. An attempt is being made to clarify the requirements outlined in the standards and their source documents.

The definitions used in the standards must be clearly defined and understood by all personnel. Therefore, the first element of this discussion must relate to definitions and their meaning as interpretated from the above referenced material.

1910.94(c)(1)(iii): **Spray Room**: A spray room is a room in which spray-finishing operations not conducted in a spray booth are performed separately from other areas. The same definition appears in ANSI Z9.3, 1964, paragraph 2.3, which is the source document for the standard. Neither 1910.107 or the NFPA Code define a spray room.

1910.94(c)(1)(ii): **Spray Booth**: This paragraph refers to the definition contained in 1910.107(a). 1910.107(a)(3) defines a spray booth as; a power-ventilated structure provided to enclose or accommodate a spraying operation to confine and limit the escape of spray, vapor, and residue, and to safely conduct or direct them to an exhaust system. ANSI Z9.3, 1964, paragraph 2.2, refers to paragraph 103 of Appendix A, which is identical to the above. NFPA 33, Chapter 1, paragraph 105, also contains an identical definition. In addition, each of the above references contain definitions of specific types of spray booths which have specific features.

In any discussion of spray booths the physical size of the booth becomes of prime importance since the size of the booth may range from something which will accommodate a product 1 inch in length by 1 inch in width by 1 inch in height to a booth which will accommodate an

object 20 feet in width by 25 feet in height and 100 feet in length. Obviously, the requirements of each of these booths would be radically different in relation to personal protective equipment and ventilation.

From the definitions provided and the wide range of spray booth size, it seems rather obvious that a spray booth and a spray room could be treated as same under certain conditions; for example, in most cases where the employee could enter the face of the booth.

1910.107(a)(2): **Spray Area**: Any area in which dangerous quantities of flammable vapors or mists, or combustible residues, dusts, or deposits are present due to the operation of spraying processes. NFPA 33, Chapter 1, paragraph 104 and ANSI Z9.3, Appendix A, paragraph 102, contain additional information which describes conditions which constitute a spray area.

The key words in these definitions are "dangerous quantities of" a substance. Therefore, to establish that a dangerous quantity exists, sampling must be accomplished to establish that the concentration is in-fact-above the lower explosive limit (LEL). It should also be noted that neither of these standards address the toxicity of any material. Toxicity is addressed only under 1910.1000, and also requires sampling to establish the concentration is in fact above the time weighted average for the substance.

In summary, adequate sampling in accordance with recognized methods are essential in sustaining the violation by establishing that a hazard did in fact exist due to documented evidence that the toxic limits of the material were exceeded or that the concentrations were above 25 percent of the lower explosive limits were exceeded.

Even though table G10 of 1910.94(c)(6)(i) establishes velocity ranges for various operations in a spray booth, there is still a requirement to establish that the hazard did exist. Therefore, simple velocity measurements are inadequate. 1910.94(c)(6)(ii) establishes a requirement that the vapor concentration in the booth be kept below 25 percent of the lower explosive limit. Therefore, if the concentrations are kept below 25 percent of the lower explosive limit in all areas of the booth, even though the air velocities in the cross sectional area of the booth are below that defined by table G10, 1910.94(c)(6)(ii), it is doubtful that a citation could be legally sustained. On the other hand if concentrations exceed either of the referenced levels, we would cite regardless of air flow.

It should also be pointed out that these velocities as outlined in table G10 of 1910.94 were originally designed to reduce the concentrations of toxic or flammable vapor below the threshold limit valve or the lower explosive limit and that simple velocity measurement would assure that the exposure of an employee was within the limits of tolerance except in the most unusual circumstances.

Since the standards were developed with a built-in safety factor to protect the employee, it would seem that if the flow velocities were measured at or above the valves required by the standard that one could assume that a hazard did not exist. It would appear that we are applying a double standard to the operation of which only one is necessary except in very unusual circumstances, but we must establish that a hazard was present and therefore, the

requirement for sampling.

Since we have defined a spray area in 1910.107(a)(2) - as where dangerous quantities of vapor or mist, etc. are present - it is not entirely compatible with the definition of a hazardous area as defined in NFPA Electric Code, Article 516. This definition (NFPA, Article 516) does not rely on concentrations, but makes a determination on the basis of use of a flammable or combustible substance. In view of the definition contained in NFPA Electric Code, Article 516, the electric wiring in all spraying areas (Spray booths, rooms, etc.) where spray finishing is performed regularly or frequently shall conform to the wiring requirements of the Code. The question then arises as to what is regular or frequently and what quantities are involved.

If a spray finish operation is a part of a daily production schedule, it is considered to be performed regularly. If it is not part of a daily production schedule but is performed on multiple shifts or days during a week then it is frequent.

Operations involving small quantities of spray materials used in areas where the quantity of flammable material would not produce a concentration in excess of 25 percent of the lower explosive limit should not be considered as spray areas as related to ventilation or the National Electric Code, unless there is documentation that the lower explosive limit has been exceeded in areas outside of the direct spray area.

Cois M. Brown
Originator: Carlyle F. Bunn
Assistant Regional Administrator
Safety Engineer for Technical Support

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Occupational Safety & Health Administration
200 Constitution Avenue, NW
Washington, DC 20210

Regulations (Standards - 29 CFR)

Spray finishing using flammable and combustible materials. - 1910.107

Regulations (Standards - 29 CFR) - Table of Contents

- **Part Number:** 1910
- **Part Title:** Occupational Safety and Health Standards
- **Subpart:** H
- **Subpart Title:** Hazardous Materials
- **Standard Number:** 1910.107
- **Title:** Spray finishing using flammable and combustible materials.

1910.107(a)

"Definitions applicable to this section" -

1910.107(a)(1)

"Aerated solid powders." Aerated powders shall mean any powdered material used as a coating material which shall be fluidized within a container by passing air uniformly from below. It is common practice to fluidize such materials to form a fluidized powder bed and then dip the part to be coated into the bed in a manner similar to that used in liquid dipping. Such beds are also used as sources for powder spray operations.

1910.107(a)(2)

"Spraying area." Any area in which dangerous quantities of flammable vapors or mists, or combustible residues, dusts, or deposits are present due to the operation of spraying processes.

1910.107(a)(3)

"Spray booth." A power-ventilated structure provided to enclose or accommodate a spraying operation to confine and limit the escape of spray, vapor, and residue, and to safely conduct or direct them to an exhaust system.

..1910.107(a)(4)

1910.107(a)(4)

"Waterwash spray booth." A spray booth equipped with a water washing system designed to

minimize dusts or residues entering exhaust ducts and to permit the recovery of overspray finishing material.

1910.107(a)(5)

"Dry spray booth." A spray booth not equipped with a water washing system as described in subparagraph (4) of this paragraph. A dry spray booth may be equipped with

1910.107(a)(5)(i)

distribution or baffle plates to promote an even flow of air through the booth or cause the deposit of overspray before it enters the exhaust duct; or

1910.107(a)(5)(ii)

overspray dry filters to minimize dusts; or

1910.107(a)(5)(iii)

overspray dry filters to minimize dusts or residues entering exhaust ducts; or

1910.107(a)(5)(iv)

overspray dry filter rolls designed to minimize dusts or residues entering exhaust ducts; or

1910.107(a)(5)(v)

where dry powders are being sprayed, with powder collection systems so arranged in the exhaust to capture oversprayed material.

1910.107(a)(6)

"Fluidized bed". A container holding powder coating material which is aerated from below so as to form an air-supported expanded cloud of such material through which the preheated object to be coated is immersed and transported.

..1910.107(a)(7)

1910.107(a)(7)

"Electrostatic fluidized bed." A container holding powder coating material which is aerated from below so as to form an air-supported expanded cloud of such material which is electrically charged with a charge opposite to the charge of the object to be coated; such object is transported, through the container immediately above the charged and aerated materials in order to be coated.

1910.107(a)(8)

"Approved." Shall mean approved and listed by a nationally recognized testing laboratory. Refer to 1910.7 for definition of nationally recognized testing laboratory.

1910.107(a)(9)

"Listed." See "approved" in 1910.107(a)(8).

1910.107(b)

"Spray booths" -

1910.107(b)(1)

"Construction." Spray booths shall be substantially constructed of steel, securely and rigidly supported, or of concrete or masonry except that aluminum or other substantial noncombustible material may be used for intermittent or low volume spraying. Spray booths shall be designed to sweep air currents toward the exhaust outlet.

1910.107(b)(2)

"Interiors." The interior surfaces of spray booths shall be smooth and continuous without edges and otherwise designed to prevent pocketing of residues and facilitate cleaning and washing without injury.

1910.107(b)(3)

"Floors." The floor surface of a spray booth and operator's working area, if combustible, shall be covered with noncombustible material of such character as to facilitate the safe cleaning and removal of residues.

..1910.107(b)(4)

1910.107(b)(4)

"Distribution or baffle plates." Distribution or baffle plates, if installed to promote an even flow of air through the booth or cause the deposit of overspray before it enters the exhaust duct, shall be of noncombustible material and readily removable or accessible on both sides for cleaning. Such plates shall not be located in exhaust ducts.

1910.107(b)(5)

"Dry type overspray collectors - (exhaust air filters)." In conventional dry type spray booths, overspray dry filters or filter rolls, if installed, shall conform to the following:

1910.107(b)(5)(i)

The spraying operations except electrostatic spraying operations shall be so designed, installed and maintained that the average air velocity over the open face of the booth (or

booth cross section during spraying operations) shall be not less than 100 linear feet per minute. Electrostatic spraying operations may be conducted with an air velocity over the open face of the booth of not less than 60 linear feet per minute, or more, depending on the volume of the finishing material being applied and its flammability and explosion characteristics. Visible gauges or audible alarm or pressure activated devices shall be installed to indicate or insure that the required air velocity is maintained. Filter rolls shall be inspected to insure proper replacement of filter media.

1910.107(b)(5)(ii)

All discarded filter pads and filter rolls shall be immediately removed to a safe, well-detached location or placed in a water-filled metal container and disposed of at the close of the day's operation unless maintained completely in water.

..1910.107(b)(5)(iii)

1910.107(b)(5)(iii)

The location of filters in a spray booth shall be so as to not reduce the effective booth enclosure of the articles being sprayed.

1910.107(b)(5)(iv)

Space within the spray booth on the downstream and upstream sides of filters shall be protected with approved automatic sprinklers.

1910.107(b)(5)(v)

Filters or filter rolls shall not be used when applying a spray material known to be highly susceptible to spontaneous heating and ignition.

1910.107(b)(5)(vi)

Clean filters or filter rolls shall be noncombustible or of a type having a combustibility not in excess of class 2 filters as listed by Underwriters' Laboratories, Inc. Filters and filter rolls shall not be alternately used for different types of coating materials, where the combination of materials may be conducive to spontaneous ignition. See also paragraph (g)(6) of this section.

1910.107(b)(6)

"Frontal area." Each spray booth having a frontal area larger than 9 square feet shall have a metal deflector or curtain not less than 2 1/2 inches deep installed at the upper outer edge of the booth over the opening.

1910.107(b)(7)

"Conveyors." Where conveyors are arranged to carry work into or out of spray booths, the

openings therefor shall be as small as practical.

..1910.107(b)(8)

1910.107(b)(8)

"Separation of operations." Each spray booth shall be separated from other operations by not less than 3 feet, or by a greater distance, or by such partition or wall as to reduce the danger from juxtaposition of hazardous operations. See also paragraph (c)(1) of this section.

1910.107(b)(9)

"Cleaning." Spray booths shall be so installed that all portions are readily accessible for cleaning. A clear space of not less than 3 feet on all sides shall be kept free from storage or combustible construction.

1910.107(b)(10)

"Illumination." When spraying areas are illuminated through glass panels or other transparent materials, only fixed lighting units shall be used as a source of illumination. Panels shall effectively isolate the spraying area from the area in which the lighting unit is located, and shall be of a noncombustible material of such a nature or so protected that breakage will be unlikely. Panels shall be so arranged that normal accumulations of residue on the exposed surface of the panel will not be raised to a dangerous temperature by radiation or conduction from the source of illumination.

1910.107(c)

"Electrical and other sources of ignition" -

1910.107(c)(1)

"Conformance." All electrical equipment, open flames and other sources of ignition shall conform to the requirements of this paragraph, except as follows:

..1910.107(c)(1)(i)

1910.107(c)(1)(i)

Electrostatic apparatus shall conform to the requirements of paragraphs (h) and (i) of this section;

1910.107(c)(1)(ii)

Drying, curing, and fusion apparatus shall conform to the requirements of paragraph (j) of this section;

1910.107(c)(1)(iii)

Automobile undercoating spray operations in garages shall conform to the requirements of paragraph (k) of this section;

1910.107(c)(1)(iv)

Powder coating equipment shall conform to the requirements of paragraph (c)(1) of this section.

1910.107(c)(2)

"Minimum separation." There shall be no open flame or spark producing equipment in any spraying area nor within 20 feet thereof, unless separated by a partition.

1910.107(c)(3)

"Hot surfaces." Space-heating appliances, steampipes, or hot surfaces shall not be located in a spraying area where deposits of combustible residues may readily accumulate.

1910.107(c)(4)

"Wiring conformance." Electrical wiring and equipment shall conform to the provisions of this paragraph and shall otherwise be in accordance with subpart S of this part.

..1910.107(c)(5)

1910.107(c)(5)

"Combustible residues, areas." Unless specifically approved for locations containing both deposits of readily ignitable residue and explosive vapors, there shall be no electrical equipment in any spraying area, whereon deposits of combustible residues may readily accumulate, except wiring in rigid conduit or in boxes or fittings containing no taps, splices, or terminal connections.

1910.107(c)(6)

"Wiring type approved." Electrical wiring and equipment not subject to deposits of combustible residues but located in a spraying area as herein defined shall be of explosion-proof type approved for Class I, group D locations and shall otherwise conform to the provisions of subpart S of this part, for Class I, Division 1, Hazardous Locations. Electrical wiring, motors, and other equipment outside of but within twenty (20) feet of any spraying area, and not separated therefrom by partitions, shall not produce sparks under normal operating conditions and shall otherwise conform to the provisions of subpart S of this part for Class I, Division 2 Hazardous Locations.

1910.107(c)(7)

"Lamps." Electric lamps outside of, but within twenty (20) feet of any spraying area, and not separated therefrom by a partition, shall be totally enclosed to prevent the falling of hot particles and shall be protected from mechanical injury by suitable guards or by location.

1910.107(c)(8)

"Portable lamps." Portable electric lamps shall not be used in any spraying area during spraying operations. Portable electric lamps, if used during cleaning or repairing operations, shall be of the type approved for hazardous Class I locations.

..1910.107(c)(9)

1910.107(c)(9)

"Grounding."

1910.107(c)(9)(i)

All metal parts of spray booths, exhaust ducts, and piping systems conveying flammable or combustible liquids or aerated solids shall be properly electrically grounded in an effective and permanent manner.

1910.107(c)(9)(ii)

[Reserved]

1910.107(d)

"Ventilation" -

1910.107(d)(1)

"Conformance." Ventilating and exhaust systems shall be in accordance with the Standard for Blower and Exhaust Systems for Vapor Removal, NFPA No. 91-1961, which is incorporated by reference as specified in Sec. 1910.6, where applicable and shall also conform to the provisions of this section.

1910.107(d)(2)

"General." All spraying areas shall be provided with mechanical ventilation adequate to remove flammable vapors, mists, or powders to a safe location and to confine and control combustible residues so that life is not endangered. Mechanical ventilation shall be kept in operation at all times while spraying operations are being conducted and for a sufficient time thereafter to allow vapors from drying coated articles and drying finishing material residue to be exhausted.

..1910.107(d)(3)

1910.107(d)(3)

"Independent exhaust." Each spray booth shall have an independent exhaust duct system discharging to the exterior of the building, except that multiple cabinet spray booths in which identical spray finishing material is used with a combined frontal area of not more than 18 square feet may have a common exhaust. If more than one fan serves one booth, all fans shall be so interconnected that one fan cannot operate without all fans being operated.

1910.107(d)(4)

"Fan-rotating element." The fan-rotating element shall be nonferrous or nonsparking or the casing shall consist of or be lined with such material. There shall be ample clearance between the fan-rotating element and the fan casing to avoid a fire by friction, necessary allowance being made for ordinary expansion and loading to prevent contact between moving parts and the duct or fan housing. Fan blades shall be mounted on a shaft sufficiently heavy to maintain perfect alignment even when the blades of the fan are heavily loaded, the shaft preferably to have bearings outside the duct and booth. All bearings shall be of the self-lubricating type, or lubricated from the outside duct.

1910.107(d)(5)

"Electric motors." Electric motors driving exhaust fans shall not be placed inside booths or ducts. See also paragraph (c) of this section.

1910.107(d)(6)

"Belts." Belts shall not enter the duct or booth unless the belt and pulley within the duct or booth are thoroughly enclosed.

..1910.107(d)(7)

1910.107(d)(7)

"Exhaust ducts." Exhaust ducts shall be constructed of steel and shall be substantially supported. Exhaust ducts without dampers are preferred; however, if dampers are installed, they shall be maintained so that they will be in a full open position at all times the ventilating system is in operation.

1910.107(d)(7)(i)

Exhaust ducts shall be protected against mechanical damage and have a clearance from unprotected combustible construction or other combustible material of not less than 18 inches.

1910.107(d)(7)(ii)

If combustible construction is provided with the following protection applied to all surfaces

within 18 inches, clearances may be reduced to the distances indicated:

```
(a) 28-gage sheet metal on 1/4-inch asbestos mill board.  12 inches.
(b) 28-gage sheet metal on 1/8-inch asbestos mill board    9 inches.
    spaced out 1 inch on noncombustible spacers.
(c) 22-gage sheet metal on 1-inch rockwool batts           3 inches.
    reinforced with wire mesh or the equivalent.
(d) Where ducts are protected with an approved automatic
    sprinkler system, properly maintained, the clearance
    required in subdivision (i) of this subparagraph may
    be reduced to 6 inches.
```

1910.107(d)(8)

"Discharge clearance." Unless the spray booth exhaust duct terminal is from a water-wash spray booth, the terminal discharge point shall be not less than 6 feet from any combustible exterior wall or roof nor discharge in the direction of any combustible construction or unprotected opening in any noncombustible exterior wall within 25 feet.

1910.107(d)(9)

"Air exhaust." Air exhaust from spray operations shall not be directed so that it will contaminate makeup air being introduced into the spraying area or other ventilating intakes, nor directed so as to create a nuisance. Air exhausted from spray operations shall not be recirculated.

1910.107(d)(10)

"Access doors." When necessary to facilitate cleaning, exhaust ducts shall be provided with an ample number of access doors.

..1910.107(d)(11)

1910.107(d)(11)

"Room intakes." Air intake openings to rooms containing spray finishing operations shall be adequate for the efficient operation of exhaust fans and shall be so located as to minimize the creation of dead air pockets.

1910.107(d)(12)

"Drying spaces." Freshly sprayed articles shall be dried only in spaces provided with adequate ventilation to prevent the formation of explosive vapors. In the event adequate and reliable ventilation is not provided such drying spaces shall be considered a spraying area. See also paragraph (j) of this section.

1910.107(e)

"Flammable and combustible liquids - storage and handling" -

1910.107(e)(1)

"Conformance." The storage of flammable or combustible liquids in connection with spraying operations shall conform to the requirements of 1910.106, where applicable.

1910.107(e)(2)

"Quantity." The quantity of flammable or combustible liquids kept in the vicinity of spraying operations shall be the minimum required for operations and should ordinarily not exceed a supply for 1 day or one shift. Bulk storage of portable containers of flammable or combustible liquids shall be in a separate, constructed building detached from other important buildings or cut off in a standard manner.

..1910.107(e)(3)

1910.107(e)(3)

"Containers." Original closed containers, approved portable tanks, approved safety cans or a properly arranged system of piping shall be used for bringing flammable or combustible liquids into spray finishing room. Open or glass containers shall not be used.

1910.107(e)(4)

"Transferring liquids." Except as provided in paragraph (e)(5) of this section the withdrawal of flammable and combustible liquids from containers having a capacity of greater than 60 gallons shall be by approved pumps. The withdrawal of flammable or combustible liquids from containers and the filling of containers, including portable mixing tanks, shall be done only in a suitable mixing room or in a spraying area when the ventilating system is in operation. Adequate precautions shall be taken to protect against liquid spillage and sources of ignition.

..1910.107(e)(5)

1910.107(e)(5)

"Spraying containers." Containers supplying spray nozzles shall be of closed type or provided with metal covers kept closed. Containers not resting on floors shall be on metal supports or suspended by wire cables. Containers supplying spray nozzles by gravity flow shall not exceed 10 gallons capacity. Original shipping containers shall not be subject to air pressure for supplying spray nozzles. Containers under air pressure supplying spray nozzles shall be of limited capacity, not exceeding that necessary for 1 day's operation; shall be designed and approved for such use; shall be provided with a visible pressure gage; and shall be provided with a relief valve set to operate in conformance with the requirements of the Code for Unfired Pressure Vessels, Section VIII of the ASME Boiler and Pressure Vessel

Code - 1968, which is incorporated by reference as specified in Sec. 1910.6. Containers under air pressure supplying spray nozzles, air-storage tanks and coolers shall conform to the standards of the Code for Unfired Pressure Vessels, Section VIII of the ASME Boiler and Pressure Vessel Code - 1968 for construction, tests, and maintenance.

1910.107(e)(6)

"Pipes and hoses."

1910.107(e)(6)(i)

All containers or piping to which is attached a hose or flexible connection shall be provided with a shutoff valve at the connection. Such valves shall be kept shut when spraying operations are not being conducted.

1910.107(e)(6)(ii)

When a pump is used to deliver products, automatic means shall be provided to prevent pressure in excess of the design working pressure of accessories, piping, and hose.

1910.107(e)(6)(iii)

All pressure hose and couplings shall be inspected at regular intervals appropriate to this service. The hose and couplings shall be tested with the hose extended, and using the "inservice maximum operating pressures." Any hose showing material deteriorations, signs of leakage, or weakness in its carcass or at the couplings, shall be withdrawn from service and repaired or discarded.

1910.107(e)(6)(iv)

Piping systems conveying flammable or combustible liquids shall be of steel or other material having comparable properties of resistance to heat and physical damage. Piping systems shall be properly bonded and grounded.

..1910.107(e)(7)

1910.107(e)(7)

"Spray liquid heaters." Electrically powered spray liquid heaters shall be approved and listed for the specific location in which used (see paragraph (c) of this section). Heaters shall not be located in spray booths nor other locations subject to the accumulation of deposits or combustible residue. If an electric motor is used, see paragraph (c) of this section.

1910.107(e)(8)

"Pump relief." If flammable or combustible liquids are supplied to spray nozzles by positive displacement pumps, the pump discharge line shall be provided with an approved relief valve discharging to a pump suction or a safe detached location, or a device provided to stop the

prime mover if the discharge pressure exceeds the safe operating pressure of the system.

1910.107(e)(9)

"Grounding." Whenever flammable or combustible liquids are transferred from one container to another, both containers shall be effectively bonded and grounded to prevent discharge sparks of static electricity.

1910.107(f)

"Protection" -

1910.107(f)(1)

"Conformance." In sprinklered buildings, the automatic sprinkler system in rooms containing spray finishing operations shall conform to the requirements of 1910.159. In unsprinklered buildings where sprinklers are installed only to protect spraying areas, the installation shall conform to such standards insofar as they are applicable. Sprinkler heads shall be located so as to provide water distribution throughout the entire booth.

..1910.107(f)(2)

1910.107(f)(2)

"Valve access." Automatic sprinklers protecting each spray booth (together with its connecting exhaust) shall be under an accessibly located separate outside stem and yoke (OS&Y) subcontrol valve.

1910.107(f)(3)

"Cleaning of heads." Sprinklers protecting spraying areas shall be kept as free from deposits as practical by cleaning daily if necessary. (See also paragraph (g) of this section.)

1910.107(f)(4)

"Portable extinguishers." An adequate supply of suitable portable fire extinguishers shall be installed near all spraying areas.

1910.107(g)

"Operations and maintenance" -

1910.107(g)(1)

"Spraying." Spraying shall not be conducted outside of predetermined spraying areas.

1910.107(g)(2)

"Cleaning." All spraying areas shall be kept as free from the accumulation of deposits of combustible residues as practical, with cleaning conducted daily if necessary. Scrapers, spuds, or other such tools used for cleaning purposes shall be of nonsparking material.

..1910.107(g)(3)

1910.107(g)(3)

"Residue disposal." Residue scrapings and debris contaminated with residue shall be immediately removed from the premises and properly disposed of. Approved metal waste cans shall be provided wherever rags or waste are impregnated with finishing material and all such rags or waste deposited therein immediately after use. The contents of waste cans shall be properly disposed of at least once daily or at the end of each shift.

1910.107(g)(4)

"Clothing storage." Spray finishing employees' clothing shall not be left on the premises overnight unless kept in metal lockers.

1910.107(g)(5)

"Cleaning solvents." The use of solvents for cleaning operations shall be restricted to those having flashpoints not less than 100 deg. F.; however, for cleaning spray nozzles and auxiliary equipment, solvents having flashpoints not less than those normally used in spray operations may be used. Such cleaning shall be conducted inside spray booths and ventilating equipment operated during cleaning.

1910.107(g)(6)

"Hazardous materials combinations." Spray booths shall not be alternately used for different types of coating materials, where the combination of the materials may be conducive to spontaneous ignition, unless all deposits of the first used material are removed from the booth and exhaust ducts prior to spraying with the second used material.

1910.107(g)(7)

"No Smoking" signs. "No smoking" signs in large letters on contrasting color background shall be conspicuously posted at all spraying areas and paint storage rooms.

..1910.107(h)

1910.107(h)

"Fixed electrostatic apparatus" -

1910.107(h)(1)

"Conformance." Where installation and use of electrostatic spraying equipment is used, such

installation and use shall conform to all other paragraphs of this section, and shall also conform to the requirements of this paragraph.

1910.107(h)(2)

"Type approval." Electrostatic apparatus and devices used in connection with coating operations shall be of approved types.

1910.107(h)(3)

"Location." Transformers, power packs, control apparatus, and all other electrical portions of the equipment, with the exception of high-voltage grids, electrodes, and electrostatic atomizing heads and their connections, shall be located outside of the spraying area, or shall otherwise conform to the requirements of paragraph (c) of this section.

1910.107(h)(4)

"Support." Electrodes and electrostatic atomizing heads shall be adequately supported in permanent locations and shall be effectively insulated from the ground. Electrodes and electrostatic atomizing heads which are permanently attached to their bases, supports, or reciprocators, shall be deemed to comply with this section. Insulators shall be nonporous and noncombustible.

..1910.107(h)(5)

1910.107(h)(5)

"Insulators, grounding." High-voltage leads to electrodes shall be properly insulated and protected from mechanical injury or exposure to destructive chemicals. Electrostatic atomizing heads shall be effectively and permanently supported on suitable insulators and shall be effectively guarded against accidental contact or grounding. An automatic means shall be provided for grounding the electrode system when it is electrically deenergized for any reason. All insulators shall be kept clean and dry.

1910.107(h)(6)

"Safe distance." A safe distance shall be maintained between goods being painted and electrodes or electrostatic atomizing heads or conductors of at least twice the sparking distance. A suitable sign indicating this safe distance shall be conspicuously posted near the assembly.

1910.107(h)(7)

"Conveyors required." Goods being painted using this process are to be supported on conveyors. The conveyors shall be so arranged as to maintain safe distances between the goods and the electrodes or electrostatic atomizing heads at all times. Any irregularly shaped or other goods subject to possible swinging or movement shall be rigidly supported to prevent such swinging or movement which would reduce the clearance to less than that

specified in paragraph (h)(6) of this section.

1910.107(h)(8)

"Prohibition." This process is not acceptable where goods being coated are manipulated by hand. When finishing materials are applied by electrostatic equipment which is manipulated by hand, see paragraph (i) of this section for applicable requirements.

..1910.107(h)(9)

1910.107(h)(9)

"Fail-safe controls." Electrostatic apparatus shall be equipped with automatic controls which will operate without time delay to disconnect the power supply to the high voltage transformer and to signal the operator under any of the following conditions:

1910.107(h)(9)(i)

Stoppage of ventilating fans or failure of ventilating equipment from any cause.

1910.107(h)(9)(ii)

Stoppage of the conveyor carrying goods through the high voltage field.

1910.107(h)(9)(iii)

Occurrence of a ground or of an imminent ground at any point on the high voltage system.

1910.107(h)(9)(iv)

Reduction of clearance below that specified in paragraph (h)(6) of this section.

1910.107(h)(10)

"Guarding." Adequate booths, fencing, railings, or guards shall be so placed about the equipment that they, either by their location or character or both, assure that a safe isolation of the process is maintained from plant storage or personnel. Such railings, fencing, and guards shall be of conducting material, adequately grounded.

1910.107(h)(11)

"Ventilation." Where electrostatic atomization is used the spraying area shall be so ventilated as to insure safe conditions from a fire and health standpoint.

..1910.107(h)(12)

1910.107(h)(12)

"Fire protection." All areas used for spraying, including the interior of the booth, shall be protected by automatic sprinklers where this protection is available. Where this protection is not available, other approved automatic extinguishing equipment shall be provided.

1910.107(i)

"Electrostatic hand spraying equipment" -

1910.107(i)(1)

"Application." This paragraph shall apply to any equipment using electrostatically charged elements for the atomization and/or, precipitation of materials for coatings on articles, or for other similar purposes in which the atomizing device is hand held and manipulated during the spraying operation.

1910.107(i)(2)

"Conformance." Electrostatic hand spraying equipment shall conform with the other provisions of this section.

1910.107(i)(3)

"Equipment approval and specifications." Electrostatic hand spray apparatus and devices used in connection with coating operations shall be of approved types. The high voltage circuits shall be designed so as to not produce a spark of sufficient intensity to ignite any vapor-air mixtures nor result in appreciable shock hazard upon coming in contact with a grounded object under all normal operating conditions. The electrostatically charged exposed elements of the handgun shall be capable of being energized only by a switch which also controls the coating material supply.

..1910.107(i)(4)

1910.107(i)(4)

"Electrical support equipment." Transformers, powerpacks, control apparatus, and all other electrical portions of the equipment, with the exception of the handgun itself and its connections to the power supply shall be located outside of the spraying area or shall otherwise conform to the requirements of paragraph (c) of this section.

1910.107(i)(5)

"Spray gun ground." The handle of the spraying gun shall be electrically connected to ground by a metallic connection and to be so constructed that the operator in normal operating position is in intimate electrical contact with the grounded handle.

1910.107(i)(6)

"Grounding - general." All electrically conductive objects in the spraying area shall be

adequately grounded. This requirement shall apply to paint containers, wash cans, and any other objects or devices in the area. The equipment shall carry a prominent permanently installed warning regarding the necessity for this grounding feature.

1910.107(i)(7)

"Maintenance of grounds." Objects being painted or coated shall be maintained in metallic contact with the conveyor or other grounded support. Hooks shall be regularly cleaned to insure this contact and areas of contact shall be sharp points or knife edges where possible. Points of support of the object shall be concealed from random spray where feasible and where the objects being sprayed are supported from a conveyor, the point of attachment to the conveyor shall be so located as to not collect spray material during normal operation.

..1910.107(i)(8)

1910.107(i)(8)

"Interlocks." The electrical equipment shall be so interlocked with the ventilation of the spraying area that the equipment cannot be operated unless the ventilation fans are in operation.

1910.107(i)(9)

"Ventilation." The spraying operation shall take place within a spray area which is adequately ventilated to remove solvent vapors released from the operation.

1910.107(j)

"Drying, curing, or fusion apparatus" -

1910.107(j)(1)

"Conformance." Drying, curing, or fusion apparatus in connection with spray application of flammable and combustible finishes shall conform to the Standard for Ovens and Furnaces, NFPA 86A-1969, which is incorporated by reference as specified in Sec. 1910.6, where applicable and shall also conform with the following requirements of this paragraph.

1910.107(j)(2)

"Alternate use prohibited." Spray booths, rooms, or other enclosures used for spraying operations shall not alternately be used for the purpose of drying by any arrangement which will cause a material increase in the surface temperature of the spray booth, room, or enclosure.

..1910.107(j)(3)

1910.107(j)(3)

"Adjacent system interlocked." Except as specifically provided in paragraph (j)(4) of this section, drying, curing, or fusion units utilizing a heating system having open flames or which may produce sparks shall not be installed in a spraying area, but may be installed adjacent thereto when equipped with an interlocked ventilating system arranged to:

1910.107(j)(3)(i)

Thoroughly ventilate the drying space before the heating system can be started;

1910.107(j)(3)(ii)

Maintain a safe atmosphere at any source of ignition;

1910.107(j)(3)(iii)

Automatically shut down the heating system in the event of failure of the ventilating system.

1910.107(j)(4)

"Alternate use permitted." Automobile refinishing spray booths or enclosures, otherwise installed and maintained in full conformity with this section, may alternately be used for drying with portable electrical infrared drying apparatus when conforming with the following:

1910.107(j)(4)(i)

Interior (especially floors) of spray enclosures shall be kept free of overspray deposits.

1910.107(j)(4)(ii)

During spray operations, the drying apparatus and electrical connections and wiring thereto shall not be located within spray enclosure nor in any other location where spray residues may be deposited thereon.

..1910.107(j)(4)(iii)

1910.107(j)(4)(iii)

The spraying apparatus, the drying apparatus, and the ventilating system of the spray enclosure shall be equipped with suitable interlocks so arranged that:

1910.107(j)(4)(iii)(a)

The spraying apparatus cannot be operated while the drying apparatus is inside the spray enclosure.

1910.107(j)(4)(iii)(b)

The spray enclosure will be purged of spray vapors for a period of not less than 3 minutes before the drying apparatus can be energized.

1910.107(j)(4)(iii)(c)

The ventilating system will maintain a safe atmosphere within the enclosure during the drying process and the drying apparatus will automatically shut off in the event of failure of the ventilating system.

1910.107(j)(4)(iv)

All electrical wiring and equipment of the drying apparatus shall conform with the applicable sections of subpart S of this part. Only equipment of a type approved for Class I, Division 2 hazardous locations shall be located within 18 inches of floor level. All metallic parts of the drying apparatus shall be properly electrically bonded and grounded.

1910.107(j)(4)(v)

The drying apparatus shall contain a prominently located, permanently attached warning sign indicating that ventilation should be maintained during the drying period and that spraying should not be conducted in the vicinity that spray will deposit on apparatus.

..1910.107(k)

1910.107(k)

"Automobile undercoating in garages." Automobile undercoating spray operations in garages, conducted in areas having adequate natural or mechanical ventilation, are exempt from the requirements pertaining to spray finishing operations, when using undercoating materials not more hazardous than kerosene (as listed by Underwriters' Laboratories in respect to fire hazard rating 30-40) or undercoating materials using only solvents listed as having a flash point in excess of 100 deg. F. Undercoating spray operations not conforming to these provisions are subject to all requirements of this section pertaining to spray finishing operations.

1910.107(l)

"Powder coating" -

1910.107(l)(1)

"Electrical and other sources of ignition." Electrical equipment and other sources of ignition shall conform to the requirements of paragraphs (c)(1) (i)-(iv), (8) and (9)(i) of this section and subpart S of this part.

1910.107(l)(2)

"Ventilation."

1910.107(l)(2)(i)

In addition to the provisions of paragraph (d) of this section, where applicable, exhaust ventilation shall be sufficient to maintain the atmosphere below the lowest explosive limits for the materials being applied. All nondeposited air-suspended powders shall be safely removed via exhaust ducts to the powder recovery cyclone or receptacle. Each installation shall be designed and operated to meet the foregoing performance specification.

1910.107(l)(2)(ii)

Powders shall not be released to the outside atmosphere.

1910.107(l)(3)

"Drying, curing, or fusion equipment." The provisions of the Standard for ovens and furnaces, NFPA No. 86A-1969 shall apply where applicable.

..1910.107(l)(4)

1910.107(l)(4)

"Operation and maintenance."

1910.107(l)(4)(i)

All areas shall be kept free of the accumulation of powder coating dusts, particularly such horizontal surfaces as ledges, beams, pipes, hoods, booths, and floors.

1910.107(l)(4)(ii)

Surfaces shall be cleaned in such manner as to avoid scattering dust to other places or creating dust clouds.

1910.107(l)(4)(iii)

"No Smoking" signs in large letters on contrasting color background shall be conspicuously posted at all powder coating areas and powder storage rooms.

1910.107(l)(5)

"Fixed electrostatic spraying equipment." The provisions of paragraph (h) of this section and other subparagraphs of this paragraph shall apply to fixed electrostatic equipment, except that electrical equipment not covered therein shall conform to paragraph (l)(1) of this section.

1910.107(l)(6)

"Electrostatic hand spraying equipment." The provisions of paragraph (i) of this section and other subparagraphs of this paragraph, shall apply to electrostatic handguns when used in powder coating, except that electrical equipment not covered therein shall conform to paragraph (l)(1) of this section.

..1910.107(l)(7)

1910.107(l)(7)

"Electrostatic fluidized beds."

1910.107(l)(7)(i)

Electrostatic fluidized beds and associated equipment shall be of approved types. The maximum surface temperature of this equipment in the coating area shall not exceed 150 deg. F. The high voltage circuits shall be so designed as to not produce a spark of sufficient intensity to ignite any powder-air mixtures nor result in appreciable shock hazard upon coming in contact with a grounded object under normal operating conditions.

1910.107(l)(7)(ii)

Transformers, powerpacks, control apparatus, and all other electrical portions of the equipment, with the exception of the charging electrodes and their connections to the power supply shall be located outside of the powder coating area or shall otherwise conform to the requirements of paragraph (l)(1) of this section.

1910.107(l)(7)(iii)

All electrically conductive objects within the charging influence of the electrodes shall be adequately grounded. The powder coating equipment shall carry a prominent, permanently installed warning regarding the necessity for grounding these objects.

1910.107(l)(7)(iv)

Objects being coated shall be maintained in contact with the conveyor or other support in order to insure proper grounding. Hangers shall be regularly cleaned to insure effective contact and areas of contact shall be sharp points or knife edges where possible.

1910.107(l)(7)(v)

The electrical equipment shall be so interlocked with the ventilation system that the equipment cannot be operated unless the ventilation fans are in operation.

..1910.107(m)

1910.107(m)

"Organic peroxides and dual component coatings" -

1910.107(m)(1)

"Conformance." All spraying operations involving the use of organic peroxides and other dual component coatings shall be conducted in approved sprinklered spray booths meeting the requirements of this section.

1910.107(m)(2)

"Smoking." Smoking shall be prohibited and "No Smoking" signs shall be prominently displayed and only nonsparking tools shall be used in any area where organic peroxides are stored, mixed or applied.

1910.107(n)

"Scope." This section applies to flammable and combustible finishing materials when applied as a spray by compressed air, "airless" or "hydraulic atomization," steam, electrostatic methods, or by any other means in continuous or intermittent processes. The section also covers the application of combustible powders by powder spray guns, electrostatic powder spray guns, fluidized beds, or electrostatic fluidized beds. The section does not apply to outdoor spray application of buildings, tanks, or other similar structures, nor to small portable spraying apparatus not used repeatedly in the same location.

[39 FR 23502, June 27, 1974, as amended at 45 FR 60704, Sept. 12, 1980; 49 FR 5322, Feb. 10, 1984; 53 FR 12121, Apr. 12, 1988; 61 FR 9227, March 7, 1996]

Next Standard (1910.108)

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Occupational Safety & Health Administration
200 Constitution Avenue, NW
Washington, DC 20210

Spray Operations:
Controls

Painting and paint removal present hazards requiring effective controls. Hazards include exposure to toxic materials and flammable or explosive mists, particulates, and vapors. Potential physical and health hazards can be effectively controlled by appropriate work procedures, controls, facility design, protective clothing, and equipment.

One of the most frequent types of spray operations is spray painting, and spray booths are a common engineering control used to protect workers. Spray booths serve two main purposes: (1) to protect the health of the painter, and (2) to reduce fire and explosion hazards. The following links provide further examples to help you control hazards during a spray operation.

Spray Operation Controls

- Controlling Lead Exposures in the Construction Industry. OSHA Technical Manual (TED 1-0.15A), Section V: Chapter 3 (1999, January 20), 29 pages. This chapter of the OSHA Technical Manual includes controls for spray painting with lead-based paint.
- Painting Operations. Office of Health and Safety, Centers for Disease Control (CDC), Engineering Services Safety Manual, Section 16-00-100 (1997, January 2), 67 pages. This section of the Engineering Services Safety Manual describes the hazards of paint spraying operations and discusses appropriate controls.

spraying operations and discusses appropriate controls.

Compliance

Due to the amount of information, the Compliance section is located on a separate page.

Training

- OSHA Training Institute Schedule of Courses. Office of Training and Education (2002), 82 KB PDF, 43 pages. Scroll down to read about the following course:
  - #310 Applied Spray Finishing and Coating Principles.

Revision Date: 19 November 2001

Spray Operations (continued)

Compliance

There are several OSHA Standards that contain requirements for spray operations. Some standards directly address spray operations (e.g., 1910.94 "Ventilation" and 1910.107 "Spray finishing using flammable and combustible materials"), while other standards contain certain provisions for spray operations. Related standards are listed below.

- **OSHA Standards**

General Industry

- 1910.94, Ventilation. Contains extensive requirements for spray booths and other spray-finishing operations.
- 1910.107, Spray finishing using flammable and combustible materials.
- 1910.134, Respiratory Protection.
- 1910.269, Electric Power Generation, Transmission, and Distribution. Contains requirements for sprayers and related equipment.

Construction

- 1926.57, Ventilation. Contains extensive requirements for spray booths and other spray-finishing operations.
- 1926.60, Methylenedianiline. Requires respiratory protection for spray-application processes.
- 1926.62, Lead. Contains requirements for spray painting with lead paint.
- 1926.66, Criteria for design and construction of spray booths.

- 1926.103, Respiratory protection.
- 1926.152, Flammable and combustible liquids. The quantity of flammable or combustible liquids kept in the vicinity of spraying operations should be kept at a minimum and should not exceed a supply for one day or one shift.
- 1926.302, Power-operated hand tools. Contains requirements for high-pressure spray guns.
- 1926.1127, Cadmium. Respiratory protection is necessary when using spray methods to apply materials containing cadmium.

Shipyard Employment

- 1915.35, Painting.

Marine Terminals

- 1917.153, Spray painting (See also 1917.2, definition of Hazardous cargo, materials, substance, or atmosphere).
- 1917.158, Prohibited operations. Abrasive blasting and spray painting are not allowed near cargo handling operations.

Longshoring

- 1918.96, Maintenance and repair work in the vicinity of longshoring operations. Abrasive blasting and spray painting are not allowed near longshoring operations.

- **OSHA Directives**
  - Clarification of 29 CFR 1910.107(b)(5)(i) Average Air Velocity of Spray Booths. STD 1-5.10 (1978, October30), 1 page. The air velocity requirements of this paragraph apply to maintaining the concentration of flammable vapors below the LEL; it does not apply to controlling exposures below PELs.
  - Uniformity in Interpretation of 29 CFR

1910.107(b)(5)(iv) and 29 CFR 1910.107(f)(1). STD 1-5.11 (1978, October 30), 2 pages. Clarifies requirements for fire-extinguishing systems in spray areas.

- 29 CFR 1926.62, Lead Exposure In Construction; Interim Final Rule – Inspection and Compliance Procedures. CPL 2-2.58 (1993, December 13), 38 pages. Spray painting with lead-based paint requires interim worker protection under the standard.
- Application of the Permit-Required Confined Spaces (PRCS) Standards, 29 CFR 1910.146. CPL 2.100 (1995, May 5), 33 pages. A paint spray enclosure is considered a confined space if an employee has to crawl to gain access to the workstation.

- **OSHA Unified Agenda**
  - Update and Revision of the Spray Applications Standard [Completed Actions]. OSHA Unified Agenda (2001, December 5). This plain language effort will revise one of OSHA's most complex and out-of-date rules, those for spray finishing using flammable and combustible liquids (29 CFR 1010.107). OSHA is withdrawing this entry from the agenda at this time due to resource constraints and other priorities.

- **Review Commission and Administrative Law Judge Decisions**
  The Occupational Safety and Health Review Commission (OSHRC) is an independent Federal agency created to decide contests of citations or penalties resulting from OSHA inspections of American work places. To locate decisions related to this topic, search for keywords at the OSHRC site.

- **Standard Interpretations and Compliance Letters**
  - Standard Interpretations relating to 1910.107.

- Search for all Interpretations and Letters related to Spray Operations.

- **Other Standards**
  - ANSI/AIHA Z9.3-1994 Standard for Spray Finishing Operations (summary). AIHA (1995), 27 pages. Available for purchase from AIHA or ANSI.
  - NFPA 33: Standard for Spray Application Using Flammable or Combustible Materials, 1995 Edition. Available for purchase from NFPA.

Revision Date: 18 March 2002

Flammable and combustible liquids. - 1910.106

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- **Part Number:** 1910
- **Part Title:** Occupational Safety and Health Standards
- **Subpart:** H
- **Subpart Title:** Hazardous Materials
- **Standard Number:** 1910.106
- **Title:** Flammable and combustible liquids.

1910.106(a)

"Definitions." As used in this section:

1910.106(a)(1)

Aerosol shall mean a material which is dispensed from its container as a mist, spray, or foam by a propellant under pressure.

1910.106(a)(2)

Atmospheric tank shall mean a storage tank which has been designed to operate at pressures from atmospheric through 0.5 p.s.i.g.

1910.106(a)(3)

Automotive service station shall mean that portion of property where flammable or combustible liquids used as motor fuels are stored and dispensed from fixed equipment into the fuel tanks of motor vehicles and shall include any facilities available for the sale and service of tires, batteries, and accessories, and for minor automotive maintenance work. Major automotive repairs, painting, body and fender work are excluded.

1910.106(a)(4)

Basement shall mean a story of a building or structure having one-half or more of its height below ground level and to which access for fire fighting purposes is unduly restricted.

..1910.106(a)(5)

1910.106(a)(5)

Boiling point shall mean the boiling point of a liquid at a pressure of 14.7 pounds per square inch absolute (p.s.i.a.) (760 mm.). Where an accurate boiling point is unavailable for the material in question, or for mixtures which do not have a constant boiling point, for purposes of this section the 10 percent point of a distillation performed in accordance with the

Standard Method of Test for Distillation of Petroleum Products, ASTM D-86-62, which is incorporated by reference as specified in Sec. 1910.6, may be used as the boiling point of the liquid.

1910.106(a)(6)

Boilover shall mean the expulsion of crude oil (or certain other liquids) from a burning tank. The light fractions of the crude oil burnoff producing a heat wave in the residue, which on reaching a water strata may result in the expulsion of a portion of the contents of the tank in the form of froth.

1910.106(a)(7)

Bulk plant shall mean that portion of a property where flammable or combustible liquids are received by tank vessel, pipelines, tank car, or tank vehicle, and are stored or blended in bulk for the purpose of distributing such liquids by tank vessel, pipeline, tank car, tank vehicle, or container.

1910.106(a)(8)

Chemical plant shall mean a large integrated plant or that portion of such a plant other than a refinery or distillery where flammable or combustible liquids are produced by chemical reactions or used in chemical reactions.

1910.106(a)(9)

Closed container shall mean a container as herein defined, so sealed by means of a lid or other device that neither liquid nor vapor will escape from it at ordinary temperatures.

..1910.106(a)(10)

1910.106(a)(10)

Crude petroleum shall mean hydrocarbon mixtures that have a flash point below 150 deg. F. and which have not been processed in a refinery.

1910.106(a)(11)

Distillery shall mean a plant or that portion of a plant where flammable or combustible liquids produced by fermentation are concentrated,and where the concentrated products may also be mixed, stored, or packaged.

1910.106(a)(12)

Fire area shall mean an area of a building separated from the remainder of the building by construction having a fire resistance of at least 1 hour and having all communicating openings properly protected by an assembly having a fire resistance rating of at least 1 hour.

1910.106(a)(13)

Flammable aerosol shall mean an aerosol which is required to be labeled "Flammable" under the Federal Hazardous Substances Labeling Act (15 U.S.C. 1261). For the purposes of paragraph (d) of this section, such aerosols are considered Class IA liquids.

1910.106(a)(14)

"Flashpoint" means the minimum temperature at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid, and shall be determined as follows:

..1910.106(a)(14)(i)

1910.106(a)(14)(i)

For a liquid which has a viscosity of less than 45 SUS at 100 deg. F. (37.8 deg. C.), does not contain suspended solids, and does not have a tendency to form a surface film while under test, the procedure specified in the Standard Method of Test for Flashpoint by Tag Closed Tester (ASTM D-56-70), which is incorporated by reference as specified in Sec. 1910.6, shall be used.

1910.106(a)(14)(ii)

For a liquid which has a viscosity of 45 SUS or more at 100 deg. F. (37.8 deg. C.), or contains suspended solids, or has a tendency to form a surface film while under test, the Standard Method of Test for Flashpoint by Pensky-Martens Closed Tester (ASTM D-93-71) shall be used, except that the methods specified in Note 1 to section 1.1 of ASTM D-93-71 may be used for the respective materials specified in the Note. The preceding ASTM standards are incorporated by reference as specified in Sec. 1910.6.

1910.106(a)(14)(iii)

For a liquid that is a mixture of compounds that have different volatilities and flashpoints, its flashpoint shall be determined by using the procedure specified in paragraph (a)(14) (i) or (ii) of this section on the liquid in the form it is shipped. If the flashpoint, as determined by this test, is 100 deg. F. (37.8 deg. C.) or higher, an additional flashpoint determination shall be run on a sample of the liquid evaporated to 90 percent of its original volume, and the lower value of the two tests shall be considered the flashpoint of the material.

1910.106(a)(14)(iv)

Organic peroxides, which undergo auto accelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified in this subparagraph.

..1910.106(a)(15)

1910.106(a)(15)

Hotel shall mean buildings or groups of buildings under the same management in which there are sleeping accommodations for hire, primarily used by transients who are lodged with or without meals including but not limited to inns, clubs, motels, and apartment hotels.

1910.106(a)(16)

Institutional occupancy shall mean the occupancy or use of a building or structure or any portion thereof by persons harbored or detained to receive medical, charitable or other care or treatment, or by persons involuntarily detained.

1910.106(a)(17)

Liquid shall mean, for the purpose of this section, any material which has a fluidity greater than that of 300 penetration asphalt when tested in accordance with ASTM Test for Penetration for Bituminous Materials, D-5-65, which is incorporated by reference as specified in Sec. 1910.6. When not otherwise identified, the term liquid shall include both flammable and combustible liquids.

1910.106(a)(18)

"Combustible liquid" means any liquid having a flashpoint at or above 100 deg. F. (37.8 deg. C.) Combustible liquids shall be divided into two classes as follows:

1910.106(a)(18)(i)

"Class II liquids" shall include those with flashpoints at or above 100 deg. F. (37.8 deg. C.) and below 140 deg. F. (60 deg. C.), except any mixture having components with flashpoints of 200 deg. F. (93.3 deg. C.) or higher, the volume of which make up 99 percent or more of the total volume of the mixture.

..1910.106(a)(18)(ii)

1910.106(a)(18)(ii)

"Class III liquids" shall include those with flashpoints at or above 140 deg. F. (60 deg. C.) Class III liquids are subdivided into two subclasses:

1910.106(a)(18)(ii)(a)

"Class IIIA liquids" shall include those with flashpoints at or above 140 deg. F. (60 deg. C.) and below 200 deg. F. (93.3 deg. C.), except any mixture having components with flashpoints of 200 deg. F. (93.3 deg. C.), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

1910.106(a)(18)(ii)(b)

"Class IIIB liquids" shall include those with flashpoints at or above 200 deg. F. (93.3 deg. C.). This section does not cover Class IIIB liquids. Where the term "Class III liquids" is used in this section, it shall mean only Class IIIA liquids.

1910.106(a)(18)(iii)

When a combustible liquid is heated for use to within 30 deg. F. (16.7 deg. C.) of its flashpoint, it shall be handled in accordance with the requirements for the next lower class of liquids.

1910.106(a)(19)

"Flammable liquid" means any liquid having a flashpoint below 100 deg. F. (37.8 deg. C.), except any mixture having components with flashpoints of 100 deg. F. (37.8 deg. C.) or higher, the total of which make up 99 percent or more of the total volume of the mixture. Flammable liquids shall be known as Class I liquids. Class I liquids are divided into three classes as follows:

..1910.106(a)(19)(i)

1910.106(a)(19)(i)

Class IA shall include liquids having flashpoints below 73 deg. F. (22.8 deg. C.) and having a boiling point below 100 deg. F. (37.8 deg. C.).

1910.106(a)(19)(ii)

Class IB shall include liquids having flashpoints below 73 deg. F. (22.8 deg. C.) and having a boiling point at or above 100 deg. F. (37.8 deg. C.).

1910.106(a)(19)(iii)

Class IC shall include liquids having flashpoints at or above 73 deg. F. (22.8 deg. C.) and below 100 deg. F. (37.8 deg. C.).

1910.106(a)(20)

Unstable (reactive) liquid shall mean a liquid which in the pure state or as commercially produced or transported will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure, or temperature.

1910.106(a)(21)

Low-pressure tank shall mean a storage tank which has been designed to operate at pressures above 0.5 p.s.i.g. but not more than 15 p.s.i.g.

1910.106(a)(22)

Marine service station shall mean that portion of a property where flammable or combustible liquids used as fuels are stored and dispensed from fixed equipment on shore, piers, wharves, or floating docks into the fuel tanks of self-propelled craft, and shall include all facilities used in connection therewith.

..1910.106(a)(23)

1910.106(a)(23)

Mercantile occupancy shall mean the occupancy or use of a building or structure or any portion thereof for the displaying, selling, or buying of goods, wares, or merchandise.

1910.106(a)(24)

Office occupancy shall mean the occupancy or use of a building or structure or any portion thereof for the transaction of business, or the rendering or receiving of professional services.

1910.106(a)(25)

Portable tank shall mean a closed container having a liquid capacity over 60 U.S. gallons and not intended for fixed installation.

1910.106(a)(26)

Pressure vessel shall mean a storage tank or vessel which has been designed to operate at pressures above 15 p.s.i.g.

1910.106(a)(27)

Protection for exposure shall mean adequate fire protection for structures on property adjacent to tanks, where there are employees of the establishment.

1910.106(a)(28)

Refinery shall mean a plant in which flammable or combustible liquids are produced on a commercial scale from crude petroleum, natural gasoline, or other hydrocarbon sources.

1910.106(a)(29)

Safety can shall mean an approved container, of not more than 5 gallons capacity, having a spring-closing lid and spout cover and so designed that it will safely relieve internal pressure when subjected to fire exposure.

..1910.106(a)(30)

1910.106(a)(30)

Vapor pressure shall mean the pressure, measured in pounds per square inch (absolute)

exerted by a volatile liquid as determined by the "Standard Method of Test for Vapor Pressure of Petroleum Products (Reid Method)," American Society for Testing and Materials ASTM D323-68, which is incorporated by reference as specified in Sec. 1910.6.

1910.106(a)(31)

Ventilation as specified in this section is for the prevention of fire and explosion. It is considered adequate if it is sufficient to prevent accumulation of significant quantities of vapor-air mixtures in concentration over one-fourth of the lower flammable limit.

1910.106(a)(32)

Storage: Flammable or combustible liquids shall be stored in a tank or in a container that complies with paragraph (d)(2) of this section.

1910.106(a)(33)

Barrel shall mean a volume of 42 U.S. gallons.

1910.106(a)(34)

Container shall mean any can, barrel, or drum.

1910.106(a)(35)

Approved unless otherwise indicated, approved, or listed by a nationally recognized testing laboratory. Refer to 1910.7 for definition of nationally recognized testing laboratory.

1910.106(a)(36)

Listed see "approved" in 1910.106(a)(35).

..1910.106(a)(37)

1910.106(a)(37)

"SUS" means Saybolt Universal Seconds as determined by the Standard Method of Test for Saybolt Viscosity (ASTM D-88-56), and may be determined by use of the SUS conversion tables specified in ASTM Method D2161-66 following determination of viscosity in accordance with the procedures specified in the Standard Method of Test for Viscosity of Transparent and Opaque Liquids (ASTM D445-65).

1910.106(a)(38)

"Viscous" means a viscosity of 45 SUS or more.

All valves attached to tanks other than those used in connection with water loading operations shall be closed and locked.

1910.106(d)

"Container and portable tank storage" -

1910.106(d)(1)

"Scope" -

1910.106(d)(1)(i)

"General." This paragraph shall apply only to the storage of flammable or combustible liquids in drums or other containers (including flammable aerosols) not exceeding 60 gallons individual capacity and those portable tanks not exceeding 660 gallons individual capacity.

1910.106(d)(1)(ii)

"Exceptions." This paragraph shall not apply to the following:

1910.106(d)(1)(ii)(a)

Storage of containers in bulk plants, service stations, refineries, chemical plants, and distilleries;

1910.106(d)(1)(ii)(b)

Class I or Class II liquids in the fuel tanks of a motor vehicle, aircraft, boat, or portable or stationary engine;

1910.106(d)(1)(ii)(c)

Flammable or combustible paints, oils, varnishes, and similar mixtures used for painting or maintenance when not kept for a period in excess of 30 days;

1910.106(d)(1)(ii)(d)

Beverages when packaged in individual containers not exceeding 1 gallon in size.

..1910.106(d)(2)

1910.106(d)(2)

"Design, construction, and capacity of containers" -

1910.106(d)(2)(i)

"General." Only approved containers and portable tanks shall be used. Metal containers and portable tanks meeting the requirements of and containing products authorized by chapter I, title 49 of the Code of Federal Regulations (regulations issued by the Hazardous Materials Regulations Board, Department of Transportation), shall be deemed to be acceptable.

1910.106(d)(2)(ii)

"Emergency venting." Each portable tank shall be provided with one or more devices installed in the top with sufficient emergency venting capacity to limit internal pressure under fire exposure conditions to 10 p.s.i.g., or 30 percent of the bursting pressure of the tank, whichever is greater. The total venting capacity shall be not less than that specified in paragraphs (b)(2)(v) (c) or (e) of this section. At least one pressure-activated vent having a minimum capacity of 6,000 cubic feet of free air (14.7 p.s.i.a. and 60 deg. F.) shall be used. It shall be set to open at not less than 5 p.s.i.g. If fusible vents are used, they shall be actuated by elements that operate at a temperature not exceeding 300 deg. F.

1910.106(d)(2)(iii)

"Size." Flammable and combustible liquid containers shall be in accordance with Table H-12, except that glass or plastic containers of no more than 1-gallon capacity may be used for a Class IA or IB flammable liquid if:

1910.106(d)(2)(iii)(a)

1910.106(d)(2)(iii)(a)(1)

Such liquid either would be rendered unfit for its intended use by contact with metal or would excessively corrode a metal container so as to create a leakage hazard; and

..1910.106(d)(2)(iii)(a)(2)

1910.106(d)(2)(iii)(a)(2)

The user's process either would require more than 1 pint of a Class IA liquid or more than 1 quart of a Class IB liquid of a single assay lot to be used at one time, or would require the maintenance of an analytical standard liquid of a quality which is not met by the specified standards of liquids available, and the quantity of the analytical standard liquid required to be used in any one control process exceeds one-sixteenth the capacity of the container allowed under Table H-12 for the class of liquid; or

1910.106(d)(2)(iii)(b)

The containers are intended for direct export outside the United States.

TABLE H-12 - MAXIMUM ALLOWABLE SIZE OF CONTAINERS AND PORTABLE TANKS

Container type	Flammable liquids			Combustible liquids	
	Class IA	Class IB	Class IC	Class II	Class III
Glass or approved plastic	1 pt	1 qt	1 gal	1 gal	1 gal.
Metal (other than DOT drums)	1 gal	5 gal	5 gal	5 gal	5 gal.
Safety cans	2 gal	5 gal	5 gal	5 gal	5 gal.
Metal drums (DOT specifications)	60 gal	60 gal	60 gal	60 gal	60 gal.
Approved portable tanks	660 gal	660 gal	660 gal	660 gal	660 gal.

NOTE: Container exemptions: [a] Medicines, beverages, foodstuffs, cosmetics, and other common consumer items, when packaged according to commonly accepted practices, shall be exempt from the requirements of 1910.106(d)(2)(i) and (ii).

1910.106(d)(3)

"Design, construction, and capacity of storage cabinets" -

1910.106(d)(3)(i)

"Maximum capacity." Not more than 60 gallons of Class I or Class II liquids, nor more than 120 gallons of Class III liquids may be stored in a storage cabinet.

1910.106(d)(3)(ii)

"Fire resistance." Storage cabinets shall be designed and constructed to limit the internal temperature to not more than 325 deg. F. when subjected to a 10-minute fire test using the standard time-temperature curve as set forth in Standard Methods of Fire Tests of Building Construction and Materials, NFPA 251-1969, which is incorporated by reference as specified in Sec. 1910.6. All joints and seams shall remain tight and the door shall remain securely closed during the fire test. Cabinets shall be labeled in conspicuous lettering, "Flammable - Keep Fire Away."

..1910.106(d)(3)(ii)(a)

1910.106(d)(3)(ii)(a)

Metal cabinets constructed in the following manner shall be deemed to be in compliance. The bottom, top, door, and sides of cabinet shall be at least No. 18 gage sheet iron and double walled with 1 1/2 - inch air space. Joints shall be riveted, welded or made tight by some equally effective means. The door shall be provided with a three-point lock, and the door sill

shall be raised at least 2 inches above the bottom of the cabinet.

1910.106(d)(3)(ii)(b)

Wooden cabinets constructed in the following manner shall be deemed in compliance. The bottom, sides, and top shall be constructed of an approved grade of plywood at least 1 inch in thickness, which shall not break down or delaminate under fire conditions. All joints shall be rabbetted and shall be fastened in two directions with flathead woodscrews. When more than one door is used, there shall be a rabbetted overlap of not less than 1 inch. Hinges shall be mounted in such a manner as not to lose their holding capacity due to loosening or burning out of the screws when subjected to the fire test.

1910.106(d)(4)

"Design and construction of inside storage rooms" -

..1910.106(d)(4)(i)

1910.106(d)(4)(i)

"Construction." Inside storage rooms shall be constructed to meet the required fire-resistive rating for their use. Such construction shall comply with the test specifications set forth in Standard Methods of Fire Tests of Building Construction and Materials, NFPA 251-1969. Where an automatic sprinkler system is provided, the system shall be designed and installed in an acceptable manner. Openings to other rooms or buildings shall be provided with noncombustible liquid-tight raised sills or ramps at least 4 inches in height, or the floor in the storage area shall be at least 4 inches below the surrounding floor. Openings shall be provided with approved self-closing fire doors. The room shall be liquid-tight where the walls join the floor. A permissible alternate to the sill or ramp is an open-grated trench inside of the room which drains to a safe location. Where other portions of the building or other properties are exposed, windows shall be protected as set forth in the Standard for Fire Doors and Windows, NFPA No. 80-1968, which is incorporated by reference as specified in Sec. 1910.6, for Class E or F openings. Wood at least 1 inch nominal thickness may be used for shelving, racks, dunnage, scuffboards, floor overlay, and similar installations.

1910.106(d)(4)(ii)

"Rating and capacity." Storage in inside storage rooms shall comply with Table H-13.

TABLE H-13 - STORAGE IN INSIDE ROOMS

Fire protection(1) provided	Fire resistance	Maximum size	Total Allowable quantities (gals./sq. ft./ floor area)

Yes	2 hours	500 sq. ft.	10
No	2 hours	500 sq. ft.	5
Yes	1 hour	150 sq. ft.	4
No	1 hour	150 sq. ft.	2

Footnote(1) Fire protection system shall be sprinkler, water spray, carbon dioxide, or other system.

1910.106(d)(4)(iii)

"Wiring." Electrical wiring and equipment located in inside storage rooms used for Class I liquids shall be approved under subpart S of this part for Class I, Division 2 Hazardous Locations; for Class II and Class III liquids, shall be approved for general use.

1910.106(d)(4)(iv)

"Ventilation." Every inside storage room shall be provided with either a gravity or a mechanical exhaust ventilation system. Such system shall be designed to provide for a complete change of air within the room at least six times per hour. If a mechanical exhaust system is used, it shall be controlled by a switch located outside of the door. The ventilating equipment and any lighting fixtures shall be operated by the same switch. A pilot light shall be installed adjacent to the switch if Class I flammable liquids are dispensed within the room. Where gravity ventilation is provided, the fresh air intake, as well as the exhaust outlet from the room, shall be on the exterior of the building in which the room is located.

..1910.106(d)(4)(v)

1910.106(d)(4)(v)

"Storage in inside storage rooms." In every inside storage room there shall be maintained one clear aisle at least 3 feet wide. Containers over 30 gallons capacity shall not be stacked one upon the other. Dispensing shall be by approved pump or self-closing faucet only.

1910.106(d)(5)

"Storage inside building" -

1910.106(d)(5)(i)

"Egress." Flammable or combustible liquids, including stock for sale, shall not be stored so as to limit use of exits, stairways, or areas normally used for the safe egress of people.

1910.106(d)(5)(ii)

"Containers." The storage of flammable or combustible liquids in containers or portable tanks shall comply with subdivisions (iii) through (v) of this subparagraph.

1910.106(d)(5)(iii)

"Office occupancies." Storage shall be prohibited except that which is required for maintenance and operation of building and operation of equipment. Such storage shall be kept in closed metal containers stored in a storage cabinet or in safety cans or in an inside storage room not having a door that opens into that portion of the building used by the public.

1910.106(d)(5)(iv)

"Mercantile occupancies and other retail stores."

1910.106(d)(5)(iv)(a)-(d)

[Reserved]

1910.106(d)(5)(iv)(e)

Leaking containers shall be removed to a storage room or taken to a safe location outside the building and the contents transferred to an undamaged container.

..1910.106(d)(5)(v)

1910.106(d)(5)(v)

"General purpose public warehouses." Storage shall be in accordance with Table H-14 or H-15 and in buildings or in portions of such buildings cut off by standard firewalls. Material creating no fire exposure hazard to the flammable or combustible liquids may be stored in the same area.

TABLE H-14 - INDOOR CONTAINER STORAGE

Class liquid	Storage level	Gallons	
		Protected storage maximum per pile	Unprotected storage maximum per pile
A	Ground and upper floors	2,750 (50)	660 (12)
	Basement	Not permitted	Not permitted
B	Ground and upper floors	5,500 (100)	1,375 (25)
	Basement	Not permitted	Not permitted
C	Ground and upper floors	16,500 (300)	4,125 (75)
	Basement	Not permitted	Not permitted
II	Ground and upper floors	16,500	4,125

		(300)	(75)
	Basement	5,500	Not permitted
		(100)	
III	Ground and upper floors	55,000	13,750
		(1,000)	(250)
	Basement	8,250	Not permitted
		(450)	

NOTE 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage permitted in that pile shall be the smallest of the 2 or more separate maximum gallonages.

NOTE 2: Aisles shall be provided so that no container is more than 12 ft. from an aisle. Main aisles shall be at least 3 ft. wide and side aisles at least 4 ft. wide.

NOTE 3: Each pile shall be separated from each other by at least 4 ft. (Number in parenthesis indicate corresponding number of 55-gal. drums.)

TABLE H-15 - INDOOR PORTABLE TANK STORAGE

Class liquid	Storage level	Gallons	
		Protected storage maximum per pile	Unprotected storage maximum per pile
IA	Ground and upper floors	Not permitted	Not permitted
	Basement	Not permitted	Not permitted
IB	Ground and upper floors	20,000	2,000
	Basement	Not permitted	Not permitted
IC	Ground and upper floors	40,000	5,500
	Basement	Not permitted	Not permitted
II	Ground and upper floors	40,000	5,500
	Basement	20,000	Not permitted
III	Ground and upper floors	60,000	22,000
	Basement	20,000	Not permitted

NOTE 1: When 1 or more classes of materials are stored in a single pile, the maximum gallonage permitted in that pile shall be the smallest of the 2 or more separate maximum gallonages.

NOTE 2: Aisles shall be provided so that no portable tank is more than 12 ft. from an aisle. Main aisles shall be at least 8 ft. wide and side aisles at least 4 ft. wide.

NOTE 3: Each pile shall be separated from each other by at least 4 ft.

1910.106(d)(5)(vi)

"Flammable and combustible liquid warehouses or storage buildings."

1910.106(d)(5)(vi)(a)

If the storage building is located 50 feet or less from a building or line of adjoining property that may be built upon, the exposing wall shall be a blank wall having a fire-resistance rating of at least 2 hours.

1910.106(d)(5)(vi)(b)

The total quantity of liquids within a building shall not be restricted, but the arrangement of storage shall comply with Table H-14 or H-15.

1910.106(d)(5)(vi)(c)

Containers in piles shall be separated by pallets or dunnage where necessary to provide stability and to prevent excessive stress on container walls.

1910.106(d)(5)(vi)(d)

Portable tanks stored over one tier high shall be designed to nest securely, without dunnage, and adequate materials handing equipment shall be available to handle tanks safely at the upper tier level.

..1910.106(d)(5)(vi)(e)

1910.106(d)(5)(vi)(e)

No pile shall be closer than 3 feet to the nearest beam, chord, girder, or other obstruction, and shall be 3 feet below sprinkler deflectors or discharge orifices of water spray, or other overhead fire protection systems.

1910.106(d)(5)(vi)(f)

Aisles of at least 3 feet wide shall be provided where necessary for reasons of access to doors, windows or standpipe connections.

1910.106(d)(6)

"Storage outside buildings" -

1910.106(d)(6)(i)

"General." Storage outside buildings shall be in accordance with Table H-16 or H-17, and subdivisions (ii) and (iv) of this subparagraph.

TABLE H-16 - OUTDOOR CONTAINER STORAGE

			4-Distance

1-Class	2-Maximum per pile	3-Distance between piles	to property line that can be built upon	5-Distance to street, alley, public way
	gallons	feet	feet	feet
IA	1,100	5	20	10
IB	2,200	5	20	10
IC	4,400	5	20	10
II	8,800	5	10	5
III	22,000	5	10	5

NOTE 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage in that pile shall be the smallest of the 2 or more separate gallonages.

NOTE 2: Within 200 ft. of each container, there shall be a 12 ft. wide access way to permit approach of fire control apparatus.

NOTE 3: The distances listed apply to properties that have protection for exposures as defined. If there are exposures, and such protection for exposures does not exist, the distances in column 4 shall be doubled.

NOTE 4: When total quantity stored does not exceed 50 percent of maximum per pile, the distances in columns 4 and 5 may be reduced 50 percent, but not less than 3 ft.

1910.106(d)(6)(ii)

"Maximum storage." A maximum of 1,100 gallons of flammable or combustible liquids may be located adjacent to buildings located on the same premises and under the same management provided the provisions of subdivisions (a) and (b) of this subdivision are complied with.

1910.106(d)(6)(ii)(a)

[Reserved]

1910.106(d)(6)(ii)(b)

Where quantity stored exceeds 1,100 gallons, or provisions of subdivision (a) of this subdivision cannot be met, a minimum distance of 10 feet between buildings and nearest container of flammable or combustible liquid shall be maintained.

..1910.106(d)(6)(iii)

1910.106(d)(6)(iii)

"Spill containment." The storage area shall be graded in a manner to divert possible spills away from buildings or other exposures or shall be surrounded by a curb at least 6 inches

high. When curbs are used, provisions shall be made for draining of accumulations of ground or rain water or spills of flammable or combustible liquids. Drains shall terminate at a safe location and shall be accessible to operation under fire conditions.

1910.106(d)(6)(iv)

"Security." The storage area shall be protected against tampering or trespassers where necessary and shall be kept free of weeds, debris and other combustible material not necessary to the storage.

1910.106(d)(7)

"Fire control" -

1910.106(d)(7)(i)

"Extinguishers." Suitable fire control devices, such as small hose or portable fire extinguishers, shall be available at locations where flammable or combustible liquids are stored.

TABLE H-17 - OUTDOOR PORTABLE TANK STORAGE

1-Class	2-Maximum per pile	3-Distance between piles	4-Distance to property line that can be built upon	5-Distance to street, alley, public way
	gallons	feet	feet	feet
IA	2,200	5	20	10
IB	4,400	5	20	10
IC	8,800	5	20	10
II	17,600	5	10	5
III	44,000	5	10	5

NOTE 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage in that pile shall be the smallest of the 2 or more separate gallonages.

NOTE 2: Within 200 ft. of each portable tank, there shall be a 12 ft. wide access way to permit approach of fire control apparatus.

NOTE 3: The distances listed apply to properties that have protection for exposures as defined. If there are exposures, and such protection for exposures does not exist, the distances in column 4 shall be doubled.

NOTE 4: When total quantity stored does not exceed 50 percent of maximum per pile, the distances in columns 4 and 5 may be reduced 50 percent, but not less than 3 ft.

1910.106(d)(7)(i)(a)

At least one portable fire extinguisher having a rating of not less than 12-B units shall be located outside of, but not more than 10 feet from, the door opening into any room used for storage.

1910.106(d)(7)(i)(b)

At least one portable fire extinguisher having a rating of not less than 12-B units must be located not less than 10 feet, nor more than 25 feet, from any Class I or Class II liquid storage area located outside of a storage room but inside a building.

1910.106(d)(7)(ii)

"Sprinklers." When sprinklers are provided, they shall be installed in accordance with 1910.159.

..1910.106(d)(7)(iii)

1910.106(d)(7)(iii)

"Open flames and smoking." Open flames and smoking shall not be permitted in flammable or combustible liquid storage areas.

1910.106(d)(7)(iv)

"Water reactive materials." Materials which will react with water shall not be stored in the same room with flammable or combustible liquids.

1910.106(e)

"Industrial plants" -

1910.106(e)(1)

"Scope" -

1910.106(e)(1)(i)

"Application." This paragraph shall apply to those industrial plants where:

1910.106(e)(1)(i)(a)

The use of flammable or combustible liquids is incidental to the principal business, or

1910.106(e)(1)(i)(b)

Where flammable or combustible liquids are handled or used only in unit physical operations such as mixing, drying, evaporating, filtering, distillation, and similar operations which do not involve chemical reaction. This paragraph shall not apply to chemical plants, refineries or distilleries.

1910.106(e)(1)(ii)

"Exceptions." Where portions of such plants involve chemical reactions such as oxidation, reduction, halogenation, hydrogenation, alkylation, polymerization, and other chemical processes, those portions of the plant shall be in accordance with paragraph (h) of this section.

..1910.106(e)(2)

1910.106(e)(2)

"Incidental storage or use of flammable and combustible liquids" -

1910.106(e)(2)(i)

"Application." This subparagraph shall be applicable to those portions of an industrial plant where the use and handling of flammable or combustible liquids is only incidental to the principal business, such as automobile assembly, construction of electronic equipment, furniture manufacturing, or other similar activities.

1910.106(e)(2)(ii)

"Containers." Flammable or combustible liquids shall be stored in tanks or closed containers.

1910.106(e)(2)(ii)(a)

Except as provided in subdivisions (b) and (c) of this subdivision, all storage shall comply with paragraph (d) (3) or (4) of this section.

1910.106(e)(2)(ii)(b)

The quantity of liquid that may be located outside of an inside storage room or storage cabinet in a building or in any one fire area of a building shall not exceed:

1910.106(e)(2)(ii)(b)(1)

25 gallons of Class IA liquids in containers

1910.106(e)(2)(ii)(b)(2)

120 gallons of Class IB, IC, II, or III liquids in containers

1910.106(e)(2)(ii)(b)(3)

660 gallons of Class IB, IC, II, or III liquids in a single portable tank.

1910.106(e)(2)(ii)(c)

Where large quantities of flammable or combustible liquids are necessary, storage may be in tanks which shall comply with the applicable requirements of paragraph (b) of this section.

..1910.106(e)(2)(iii)

1910.106(e)(2)(iii)

"Separation and protection." Areas in which flammable or combustible liquids are transferred from one tank or container to another container shall be separated from other operations in the building by adequate distance or by construction having adequate fire resistance. Drainage or other means shall be provided to control spills. Adequate natural or mechanical ventilation shall be provided.

1910.106(e)(2)(iv)

"Handling liquids at point of final use."

1910.106(e)(2)(iv)(a)

Flammable liquids shall be kept in covered containers when not actually in use.

1910.106(e)(2)(iv)(b)

Where flammable or combustible liquids are used or handled, except in closed containers, means shall be provided to dispose promptly and safely of leakage or spills.

1910.106(e)(2)(iv)(c)

Class I liquids may be used only where there are no open flames or other sources of ignition within the possible path of vapor travel.

1910.106(e)(2)(iv)(d)

Flammable or combustible liquids shall be drawn from or transferred into vessels, containers, or portable tanks within a building only through a closed piping system, from safety cans, by means of a device drawing through the top, or from a container or portable tanks by gravity through an approved self-closing valve. Transferring by means of air pressure on the container or portable tanks shall be prohibited.

..1910.106(e)(3)

1910.106(e)(3)

"Unit physical operations" -

1910.106(e)(3)(i)

"Application." This subparagraph shall be applicable in those portions of industrial plants where flammable or combustible liquids are handled or used in unit physical operations such as mixing, drying, evaporating, filtering, distillation, and similar operations which do not involve chemical change. Examples are plants compounding cosmetics, pharmaceuticals, solvents, cleaning fluids, insecticides, and similar types of activities.

1910.106(e)(3)(ii)

"Location." Industrial plants shall be located so that each building or unit of equipment is accessible from at least one side for firefighting and fire control purposes. Buildings shall be located with respect to lines of adjoining property which may be built upon as set forth in paragraph (h)(2) (i) and (ii) of this section except that the blank wall referred to in paragraph (h)(2)(ii) of this section shall have a fire resistance rating of at least 2 hours.

1910.106(e)(3)(iii)

"Chemical processes." Areas where unstable liquids are handled or small scale unit chemical processes are carried on shall be separated from the remainder of the plant by a fire wall of 2-hour minimum fire resistance rating.

1910.106(e)(3)(iv)

"Drainage."

1910.106(e)(3)(iv)(a)

Emergency drainage systems shall be provided to direct flammable or combustible liquid leakage and fire protection water to a safe location. This may require curbs, scuppers, or special drainage systems to control the spread of fire; see paragraph (b)(2)(vii)(b) of this section.

..1910.106(e)(3)(iv)(b)

1910.106(e)(3)(iv)(b)

Emergency drainage systems, if connected to public sewers or discharged into public waterways, shall be equipped with traps or separator.

1910.106(e)(3)(v)

"Ventilation."

1910.106(e)(3)(v)(a)

Areas as defined in subdivision (i) of this subparagraph using Class I liquids shall be ventilated at a rate of not less than 1 cubic foot per minute per square foot of solid floor area. This shall be accomplished by natural or mechanical ventilation with discharge or exhaust to a safe location outside of the building. Provision shall be made for introduction of makeup air in such a manner as not to short circuit the ventilation. Ventilation shall be arranged to include all floor areas or pits where flammable vapors may collect.

1910.106(e)(3)(v)(b)

Equipment used in a building and the ventilation of the building shall be designed so as to limit flammable vapor-air mixtures under normal operating conditions to the interior of equipment, and to not more than 5 feet from equipment which exposes Class I liquids to the air. Examples of such equipment are dispensing stations, open centrifuges, plate and frame filters, open vacuum filters, and surfaces of open equipment.

1910.106(e)(3)(vi)

"Storage and handling." The storage, transfer, and handling of liquid shall comply with paragraph (h)(4) of this section.

..1910.106(e)(4)

1910.106(e)(4)

"Tank vehicle and tank car loading and unloading."

1910.106(e)(4)(i)

Tank vehicle and tank car loading or unloading facilities shall be separated from aboveground tanks, warehouses, other plant buildings or nearest line of adjoining property which may be built upon by a distance of 25 feet for Class I liquids and 15 feet for Class II and Class III liquids measured from the nearest position of any fill stem. Buildings for pumps or shelters for personnel may be a part of the facility. Operations of the facility shall comply with the appropriate portions of paragraph (f)(3) of this section.

1910.106(e)(5)

"Fire control" -

1910.106(e)(5)(i)

"Portable and special equipment." Portable fire extinguishment and control equipment shall be provided in such quantities and types as are needed for the special hazards of operation and storage.

1910.106(e)(5)(ii)

"Water supply." Water shall be available in volume and at adequate pressure to supply water hose streams, foam-producing equipment, automatic sprinklers, or water spray systems as the need is indicated by the special hazards of operation, dispensing and storage.

1910.106(e)(5)(iii)

"Special extinguishers." Special extinguishing equipment such as that utilizing foam, inert gas, or dry chemical shall be provided as the need is indicated by the special hazards of operation dispensing and storage.

1910.106(e)(5)(iv)

"Special hazards." Where the need is indicated by special hazards of operation, flammable or combustible liquid processing equipment, major piping, and supporting steel shall be protected by approved water spray systems, deluge systems, approved fire-resistant coatings, insulation, or any combination of these.

..1910.106(e)(5)(v)

1910.106(e)(5)(v)

"Maintenance." All plant fire protection facilities shall be adequately maintained and periodically inspected and tested to make sure they are always in satisfactory operating condition, and they will serve their purpose in time of emergency.

1910.106(e)(6)

"Sources of ignition" -

1910.106(e)(6)(i)

"General." Adequate precautions shall be taken to prevent the ignition of flammable vapors. Sources of ignition include but are not limited to open flames; lightning; smoking; cutting and welding; hot surfaces; frictional heat; static, electrical, and mechanical sparks; spontaneous ignition, including heat-producing chemical reactions; and radiant heat.

1910.106(e)(6)(ii)

"Grounding." Class I liquids shall not be dispensed into containers unless the nozzle and container are electrically interconnected. Where the metallic floorplate on which the container stands while filling is electrically connected to the fill stem or where the fill stem is bonded to the container during filling operations by means of a bond wire, the provisions of this section shall be deemed to have been complied with.

1910.106(e)(7)

"Electrical" -

1910.106(e)(7)(i)

"Equipment."

1910.106(e)(7)(i)(a)

All electrical wiring and equipment shall be installed according to the requirements of Subpart S of this part.

..1910.106(e)(7)(i)(b)

1910.106(e)(7)(i)(b)

Locations where flammable vapor-air mixtures may exist under normal operations shall be classified Class I, Division 1 according to the requirements of subpart S of this part. For those pieces of equipment installed in accordance with subparagraph (3)(v)(b) of this paragraph, the Division 1 area shall extend 5 feet in all directions from all points of vapor liberation. All areas within pits shall be classified Division 1 if any part of the pit is within a Division 1 or 2 classified area, unless the pit is provided with mechanical ventilation.

1910.106(e)(7)(i)(c)

Locations where flammable vapor-air mixtures may exist under abnormal conditions and for a distance beyond Division 1 locations shall be classified Division 2 according to the requirements of subpart S of this part. These locations include an area within 20 feet horizontally, 3 feet vertically beyond a Division 1 area, and up to 3 feet above floor or grade level within 25 feet, if indoors, or 10 feet if outdoors, from any pump, bleeder, withdrawal fitting, meter, or similar device handling Class I liquids. Pits provided with adequate mechanical ventilation within a Division 1 or 2 area shall be classified Division 2. If Class II or Class III liquids only are handled, then ordinary electrical equipment is satisfactory though care shall be used in locating electrical apparatus to prevent hot metal from falling into open equipment.

1910.106(e)(7)(i)(d)

Where the provisions of subdivisions (a), (b), and (c), of this subdivision require the installation of electrical equipment suitable for Class I, Division 1 or Division 2 locations, ordinary electrical equipment including switchgear may be used if installed in a room or enclosure which is maintained under positive pressure with respect to the hazardous area. Ventilation makeup air shall be uncontaminated by flammable vapors.

..1910.106(e)(8)

1910.106(e)(8)

"Repairs to equipment." Hot work, such as welding or cutting operations, use of spark-

producing power tools, and chipping operations shall be permitted only under supervision of an individual in responsible charge. The individual in responsible charge shall make an inspection of the area to be sure that it is safe for the work to be done and that safe procedures will be followed for the work specified.

1910.106(e)(9)

"Housekeeping" -

1910.106(e)(9)(i)

"General." Maintenance and operating practices shall be in accordance with established procedures which will tend to control leakage and prevent the accidental escape of flammable or combustible liquids. Spills shall be cleaned up promptly.

1910.106(e)(9)(ii)

"Access." Adequate aisles shall be maintained for unobstructed movement of personnel and so that fire protection equipment can be brought to bear on any part of flammable or combustible liquid storage, use, or any unit physical operation.

1910.106(e)(9)(iii)

"Waste and residue." Combustible waste material and residues in a building or unit operating area shall be kept to a minimum, stored in covered metal receptacles and disposed of daily.

1910.106(e)(9)(iv)

"Clear zone." Ground area around buildings and unit operating areas shall be kept free of weeds, trash, or other unnecessary combustible materials.

Regulations (Standards - 29 CFR) Flammable and Combustible liquids. - 1910.106

"Definitions."

Fire area shall mean an area of a building separated from the remainder of the building by construction having a fire resistance of at least 1 hour and having all communicating openings properly protected by an assembly having a fire resistance rating of at least 1 hour.

1

"Definitions."

"Flashpoint" means the minimum temperature at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid, and shall be determined as follows:

"Combustible liquid" means any liquid having a flashpoint at or above 100 deg. F. (37.8 deg. C.) Combustible liquids shall be divided into two classes as follows:

2

"Flammable liquid" means any liquid having a flashpoint below 100 deg. F. (37.8 deg. C.), except any mixture having components with flashpoints of 100 deg. F. (37.8 deg. C.) or higher, the total of which make up 99 percent or more of the total volume of the mixture. Flammable liquids shall be known as Class I liquids. Class I liquids are divided into three classes as follows:

3

Class IA shall include liquids having flashpoints below 73 deg. F. (22.8 deg. C.) and having a boiling point below 100 deg. F. (37.8 deg. C.).

Class IB shall include liquids having flashpoints below 73 deg. F. (22.8 deg. C.) and having a boiling point at or above 100 deg. F. (37.8 deg. C.).

Class IC shall include liquids having flashpoints at or above 73 deg. F. (22.8 deg. C.) and below 100 deg. F. (37.8 deg. C.).

4

Safety Can shall mean an approved container, of not more than 5 gallons capacity, having a spring-closing lid and spout cover and so designed that it will safely relieve internal pressure when subjected to fire exposure.

5

"Design, construction, and capacity of storage cabinets"

"Maximum capacity." Not more than 60 gallons of Class I or Class II liquids,
nor more than 120 gallons of Class III liquids may be stored in a storage cabinet

6

"Design, construction, and capacity of storage cabinets"

Metal cabinets constructed in the following manner shall be deemed to be in compliance. The bottom, top, door, and sides of cabinet shall be at least No. 18 gage sheet iron and double walled with 1 1/2 - inch air space. Joints shall be riveted, welded or made tight by some equally effective means. The door shall be provided with a three-point lock, and the door sill shall be raised at least 2 inches above the bottom of the cabinet.

7

"Design and construction of inside storage rooms"

"Construction." Inside storage rooms shall be constructed to meet the required fire-resistive rating for their use.

"Wiring." Electrical wiring and equipment located in inside storage rooms used for Class I liquids shall be approved under subpart S of this part for Class I, Division 2 Hazardous Locations; for Class II and Class III liquids, shall be approved for general use.

8

"Ventilation."

Every inside storage room shall be provided with either a gravity or a mechanical exhaust ventilation system. Such system shall be designed to provide for a complete change of air within the room at least six times per hour.

9

Quantity

The quantity of liquid that may be located outside of an inside storage room or storage cabinet in a building or in any one fire area of a building shall not exceed:
25 gallons of Class IA liquids in containers
120 gallons of Class IB, IC, II, or III liquids in containers
660 gallons of Class IB, IC, II, or III liquids in a single portable tank.

10

"Handling liquids at point of final use." 1910.106 (e)-(2)-(iv)

Flammable liquids shall be kept in covered containers when not actually in use.

Where flammable or combustible liquids are used or handled, except in closed containers, means shall be provided to dispose promptly and safely of leakage or spills

11

1910.106(e)(2)(iv)(d)

Flammable or combustible liquids shall be drawn from or transferred into vessels, containers, or portable tanks within a building only through a closed piping system, from safety cans, by means of a device drawing through the top, or from a container or portable tanks by gravity through an approved self-closing valve. Transferring by means of air pressure on the container or portable tanks shall be prohibited.

12

"Sources of ignition" - **1910.106(e)(6)(i)**

"General." Adequate precautions shall be taken to prevent the ignition of flammable vapors. Sources of ignition include but are not limited to open flames; lightning; smoking; cutting and welding; hot surfaces; frictional heat; static, electrical, and mechanical sparks; spontaneous ignition, including heat-producing chemical reactions; and radiant heat.

13

"Grounding."

Class I liquids shall not be dispensed into containers unless the nozzle and container are electrically interconnected. Where the metallic floorplate on which the container stands while filling is electrically connected to the fill stem or where the fill stem is bonded to the container during filling operations by means of a bond wire, the provisions of this section shall be deemed to have been complied with.

14

Proper Storage Location

15

WALKING-WORKING SURFACES (SLIPS, TRIPS, AND FALLS)

General Requirements

- Housekeeping
- Aisles and Passageways
- Covers and Guardrails
- Floor Loading Protection

Guarding Floor and Wall Openings and Holes

- Definitions
- Protection for Floor Openings
- Protection of Open-Sided Floors, Platforms, and Runways
- Stairway Railings and Guards

Fixed Industrial Stairs

Portable Ladders

Fixed Ladders

Safety Requirements for Scaffolding

Manually Propelled Mobile Ladder Stands and Scaffolds (Towers)

Other Working Surfaces

Reference:
OSHA General Industry Standards, Subpart D, *Walking-working Surfaces*

Discussion / Overheads - 2.18 MB

Student Handouts - 281 KB

Self-Inspection Checklist

WALKING-WORKING SURFACES (SLIPS, TRIPS, AND FALLS)

Slips, trips, and falls constitute the majority of general industry accidents. They cause 15% of all accidental deaths, and are second only to motor vehicles as a cause of fatalities. The OSHA standards for walking and working surfaces apply to all permanent places of employment, except where domestic, mining, or agricultural work only is performed.

GENERAL REQUIREMENTS

Housekeeping

Some of the most frequently overlooked general requirements involve housekeeping:

- All places of employment, passageways, storerooms, and service rooms shall be kept clean and orderly and in a sanitary condition.
- The floor of every workroom shall be maintained in a clean and, so far as possible, a dry condition. Where wet processes are used, drainage shall be maintained and gratings, mats, or raised platforms shall be provided.
- Every floor, working place and passageway shall be kept free from protruding nails, splinters, holes, or loose boards.

Aisles and Passageways

- Aisles and passageways shall be kept clear and in good repair with no obstruction across or in aisles that could create a hazard.
- Permanent aisles and passageways shall be appropriately marked.
- Where mechanical handling equipment is used, aisles shall be sufficiently wide. Improper aisle widths coupled with poor housekeeping and vehicle traffic can cause injury to employees, damage the equipment and material, and can limit egress in emergencies.

Covers and Guardrails

Covers and/or guardrails shall be provided to protect personnel from the hazards of open pits, tanks, vats, ditches, and the like.

Floor Loading Protection

Load rating limits shall be marked on plates and conspicuously posted. It shall be unlawful to place, or cause, or permit to be placed, on any floor or roof of a building or other structure, a load greater than that for which such floor or roof is approved.

GUARDING FLOOR AND WALL OPENINGS AND HOLES

Floor openings and holes, wall openings and holes, and the open sides of platforms may create hazards. People may fall through the openings or over the sides to the level below. Objects, such as tools or parts, may fall through the holes and strike people or damage machinery on lower levels.

OSHA standards for guarding openings and holes use the following definitions:

Floor hole. An opening measuring less than 12 inches but more than 1 inch in its least dimension, in any floor, platform, pavement or yard, through which materials but not persons may fall.

Floor opening. An opening measuring 12 inches or more in its least dimension, in any floor, platform, pavement, or yard, through which persons may fall.

Platform. A working space for persons, elevated above the surrounding floor or ground.

Wall hole. An opening less than 30 inches but more than 1 inch high, of unrestricted width, in any wall or partition.

Wall opening. An opening at least 30 inches high and 18 inches wide, in any wall or partition, through which persons may fall.

Protection for Floor Openings

Standard railings shall be provided on all exposed sides of a stairway opening, except at the stairway entrance. For infrequently used stairways, where traffic across the opening prevents the use of a fixed standard railing, the guard shall consist of a hinged floor opening cover of standard strength and construction along with removable standard railings on all exposed sides, except at the stairway entrance.

> A "standard railing" consists of top rail, mid rail, and posts, and shall have a vertical height of 42 inches nominal from the upper

surface of top rail to floor, platform, runway, or ramp level. Nominal height of mid rail is 21 inches.

A "standard toeboard" is 4 inches nominal in vertical height, with not more than ¼-inch clearance above floor level.

Floor openings may be covered rather than guarded with rails. When the floor opening cover is removed, a temporary guardrail shall be in place, or an attendant shall be stationed at the opening to warn personnel.

Every floor hole into which persons can accidentally walk shall be guarded by either:

- A standard railing with toeboard, or
- A floor hole cover of standard strength and construction.

While the cover is not in place, the floor hole shall be constantly attended by someone or shall be protected by a removable standard railing.

Protection of Open-Sided Floors, Platforms, and Runways

One of the most frequently overlooked requirements in walking-working surfaces is the requirement that every open-sided floor or platform 4 feet or more above adjacent floor or ground level shall be guarded by a standard railing on all open sides, except where there is an entrance to a ramp, stairway, or fixed ladder. The railing shall be provided with a toeboard wherever, beneath the open sides:

- Persons can pass,
- There is moving machinery, or
- There is equipment with which falling materials could create a hazard.

Every runway shall be guarded by a standard railing, or the equivalent, on all sides 4 feet or more above floor or ground level. Wherever tools, machine parts, or materials are likely to be used on the runway, a toeboard shall also be provided on each exposed side.

Regardless of height, open-sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment, pickling or galvanizing tanks, degreasing units, and similar hazards shall be guarded with a standard railing and toeboard.

Stairway Railings and Guards

Every flight of stairs with four or more risers shall have standard stair railings or standard handrails as specified below. Stair width is measured clear of all obstructions except handrails.

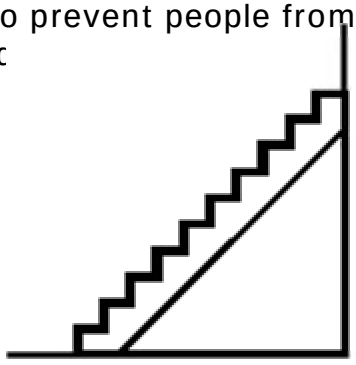
- On stairways less than 44 inches wide having both sides enclosed, at least one handrail shall be affixed, preferably on the right side descending.
- On stairways less than 44 inches wide with one open side, at least one stair rail shall be affixed on the open side.
- On stairways less than 44 inches wide having both sides open, two stair rails shall be provided, one for each side.
- On stairways more than 44 inches wide, but less than 88 inches, one handrail shall be provided on each enclosed side and one stair rail on each open side.
- On stairways 88 inches or more in width, one handrail shall be provided on each enclosed side, one stair rail on each open side, and one intermediate stair rail placed approximately in the middle of the stairs.

A "standard stair railing" (stair rail) shall be of construction similar to a standard railing, but the vertical height shall be not more than 34 inches nor less than 30 inches from the upper surface of the top rail to the surface of the tread in line with the face of the riser at the forward edge of the tread.

A "standard handrail" consists of a lengthwise member mounted directly on a wall or partition by means of brackets attached to the lower side of the handrail in order to keep a smooth, unobstructed surface along the top and both sides of the handrail. They shall hold the rail 3 inches from the wall and be no more than 8 feet apart.

The height of handrails shall be no more than 34 inches nor less than 30 inches from the upper surface of the handrail to the surface of the tread in line with the face of the riser or to the surface of the ramp.

Winding stairs shall have a handrail that is offset to prevent people from walking on any portion of the treads where the wic
inches.



FIXED INDUSTRIAL STAIRS

This section contains specifications for the safe design and construction of fixed general industrial stairs. This includes interior and exterior stairs

around machinery, tanks, and other equipment, and stairs leading to or from floors, platforms or pits. This section does not apply to stairs used for fire exit purposes, to construction operations, to private residences, or to articulated stairs, such as may be installed on floating roof tanks, the angle of which changes with the rise and fall of the base support.

Where are fixed stairs required?

Fixed Industrial Stairs shall be provided for access to and from places of work where operations necessitate regular travel between levels. OSHA requirements include:

- Fixed industrial stairs shall be strong enough to carry five times the normal anticipated live load.
- At the very minimum, any fixed stairway shall be able to carry safely a moving concentrated load of 1000 pounds.
- All fixed stairways shall have a minimum width of 22 inches.
- Fixed stairs shall be installed at angles to the horizontal of between 30° and 50°.
- Vertical clearance above any stair tread to an overhead obstruction shall be at least 7 feet measured from the leading edge of the tread.

When inspecting the condition of stairways in your place of work, here are some items to watch out for.

- Handrails and Stair rails:

  A. Lack of
  B. Placement
  C. Smoothness of surface
  D. Strength
  E. Clearance between rail and wall or other object

- Treads:

  A. Strength
  B. Slip resistance
  C. Dimensions
  D. Evenness of surface
  E. Visibility of leading edge

- Improper/inadequate design, construction or location of staircases.
- Wet, slippery, or damaged walking or grasping surfaces.

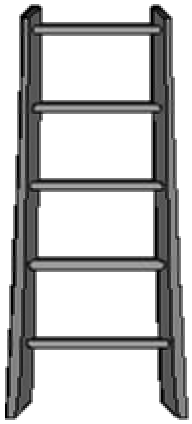
- Improper illumination...there is no general OSHA standard for illumination levels. The Illuminating Engineering Society publications should be consulted for recommendations.
- Poor housekeeping

The length of a staircase is important. Long flights of steps without landings should be avoided whenever possible.

The OSHA standards do not specify any exact number or placement of landings. The National Safety Council recommends landings at every tenth or twelfth tread.

Intermediate landings and platforms on stairways shall be no less than the stair width and a minimum of 30 inches in length measured in the direction of travel.

PORTABLE LADDERS



The chief hazard when using a ladder is falling. A poorly designed, maintained, or improperly used ladder may collapse under the load placed upon it and cause the employee to fall.

A ladder is an appliance consisting of two side rails joined at regular intervals by crosspieces on which a person may step to ascend or descend.

The various types of portable ladders include:

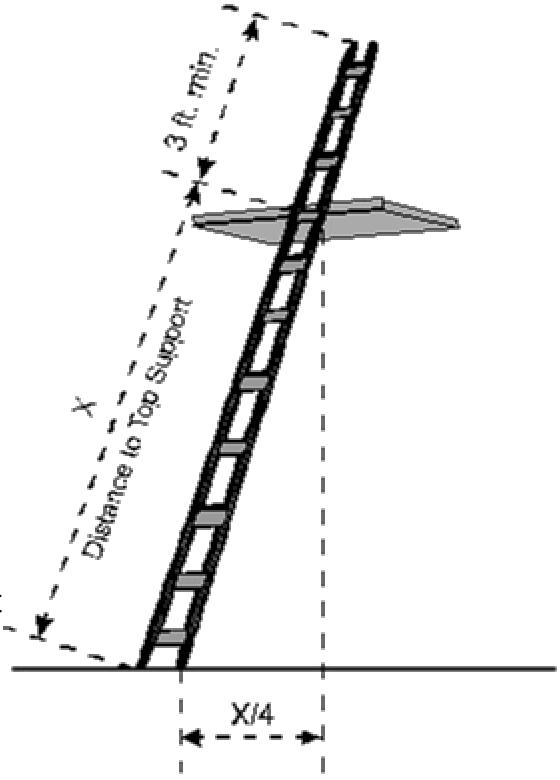
- Stepladder - A self-supporting portable ladder, non-adjustable in length, having flat steps and hinged back.
- Single Ladder - A non self-supporting portable ladder, nonadjustable in length, consisting of but one section. Its size is designed by overall length of the side rail.
- Extension Ladder - A non self-supporting portable ladder adjustable in length.

OSHA's requirements for portable ladders include:

- Portable stepladders longer than 20 feet shall not be used.
- Stepladders shall be equipped with a metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in open position.
- Single ladders longer than 30 feet shall not be used.

- Extension ladders longer than 60 feet shall not be used.
- Ladders shall be maintained in good condition at all times.
- Ladders shall be inspected frequently and those which have developed defects shall be withdrawn from service for repair or destruction and tagged or marked as "Dangerous, Do Not Use."

Proper use of ladders is essential in preventing accidents. Even a good ladder can be a serious safety hazard when used by workers in a dangerous way.



OSHA standards require the following safety precautions for ladder use:

- Ladders shall be placed with a secure footing, or they shall be lashed, or held in position.
- Ladders used to gain access to a roof or other area shall extend at least 3 feet above the point of support.
- The foot of a ladder shall, where possible, be used at such a pitch that the horizontal distance from the top support to the foot of the ladder is one-quarter of the working length of the ladder (the length along the ladder between the foot and the support). See figure above.
- The worker shall always *face* the ladder when climbing up or down.
- Short ladders shall not be spliced together to make long ladders.
- Ladders shall never be used in the horizontal position as scaffolds or work platforms.
- The top of a regular stepladder shall not be used as a step.
- Use both hands when climbing or descending ladders.
- Metal ladders shall never be used near electrical equipment.

FIXED LADDERS

A fixed ladder is a ladder permanently attached to a structure, building or equipment.

A point to remember is that fixed ladders, with a length of more than 20

feet to a maximum unbroken length of 30 feet shall be equipped with cages or a ladder safety device.

A "cage" is a guard that is fastened to the side rails of the fixed ladder or to the structure to encircle the climbing space of the ladder for the safety of the person who must climb the ladder.

Cages shall extend a minimum of 42 inches above the top of a landing, unless other acceptable protection is provided.

Cages shall extend down the ladder to a point not less than 7 feet nor more than 8 feet above the base of the ladder.

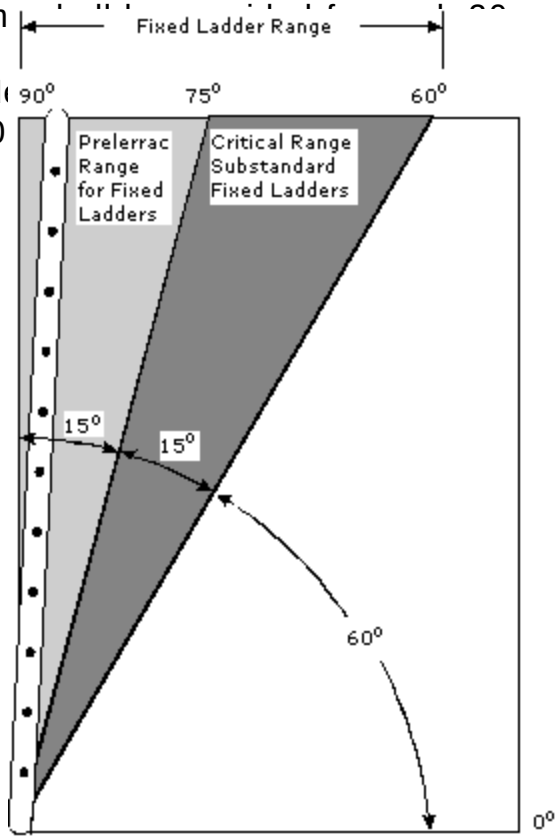
A ladder safety device is any device, other than a cage or well, designed to eliminate or reduce the possibility of accidental falls and may incorporate such features as life belts, friction brakes, and sliding attachments.

Another feature of fixed ladders is the landing platform which provides a means of interrupting a free fall and serves as a resting place during long climbs.

When fixed ladders are used to ascend to heights exceeding 20 feet (except on chimneys), landing platform
feet of height or fraction thereof, when
where no cage, well, or ladder safety d
platforms shall be provided for each 20
feet of height or fraction thereof.

Ladder safety devices may be used on tower, water tank, and chimney ladders over 20 feet in unbroken length in lieu of cage protection. No landing platform is required in these cases.

The preferred pitch of fixed ladders shall be considered to come in the range of 75 degrees and 90 degrees with the horizontal. Fixed ladders shall be considered to be substandard if

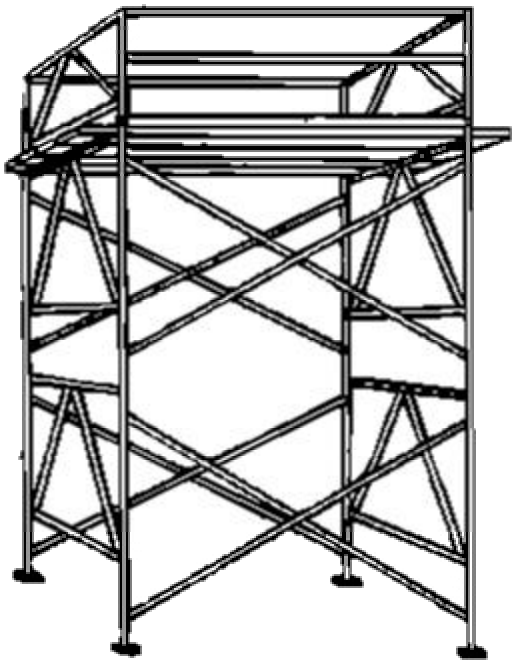


they are installed within the pitch range of 60 and 75 degrees with the horizontal. Substandard fixed ladders are permitted only where it is found necessary to meet conditions of installation. This substandard pitch range shall be considered as a critical range to be avoided, if possible.

Ladders having a pitch in excess of 90 degrees with the horizontal are prohibited.

As with all ladders, fixed ladders shall be maintained in a safe condition and inspected regularly.

SAFETY REQUIREMENTS FOR SCAFFOLDING



This section establishes safety requirements for the construction, operation, maintenance, and use of scaffolds used in the maintenance of buildings and structures.

There are a number of different types of scaffolds available. No attempt will be made here to deal with every unit individually.

It is important, however, to note some of the general requirements which apply to all scaffolds, namely:

- The footing or anchorage for scaffolds shall be sound, rigid and capable of carrying the maximum intended load without settling or displacement. Unstable objects, such as barrels, boxes, loose brick, or concrete blocks shall not be used to support scaffolds or planks.
- Scaffolds and their components shall be capable of supporting at least *four times* the maximum intended load.
- Scaffolds shall be maintained in a safe condition and shall not be altered or moved horizontally while they are in use or occupied.
- Damaged or weakened scaffolds shall be immediately repaired and shall not be used until repairs have been completed.
- A safe means must be provided to gain access to the working platform level through the use of a ladder, ramp, etc.
- Overhead protection must be provided for personnel on a scaffold exposed to overhead hazards.

- Guardrails, midrails, and toeboards must be installed on all open sides and ends of platforms more than 10 feet above the ground or floor. Wire mesh must be installed between the toeboard and the guardrail along the entire opening, where persons are required to work or pass under the scaffolds.
- Employees shall not work on scaffolds during storms or high winds or when covered with ice or snow.
- As noted earlier, there are a number of scaffold types, and 1910.28 should be reviewed carefully for special requirements that apply to each type.

MANUALLY PROPELLED MOBILE LADDER STANDS AND SCAFFOLDS (TOWERS)

This section contains requirements for the design, construction, and use of mobile work platforms (including ladder stands but not including aerial ladders) and rolling (mobile) scaffolds (towers). As in the previous section, there is a wide variety of materials and design possibilities involved, and no attempt will be made to discuss detailed design criteria at this time.

General requirements include:

- All exposed surfaces of mobile ladder stands and scaffolds shall be free from sharp edges, burrs, or other safety hazards.
- The maximum work height shall not exceed four times the minimum base dimension unless outriggers, guys or braces are added to provide stability.
- This standard requires guardrails and toeboards for work levels 10 feet or more above the ground or floor.

OSHA standard 1910.29 should be reviewed carefully for specific requirements.

OTHER WORKING SURFACES

An important requirement, which can prevent many serious accidents is contained in this section: portable dockboards (bridge plates) shall be secured in position, either by being anchored or equipped with devices which will prevent their slipping. Movement of the dockboard during material handling operations has resulted in forklifts overturning, or falling off the dock, often with serious injury or death to the driver and damage to equipment and material.

A major contribution to accident experience comes from material handling. Handholds shall be provided on portable dockboards to permit safe handling when the dockboard must be repositioned or relocated.

Discussion / Overheads - 2.18 MB

Student Handouts - 281 KB

Self - Inspection Checklist

This information was found July 22, 2002 at
http://www.osha-slc.gov/SLTC/smallbusiness/sec15.html

29 CFR 1910
SUBPART D

WALKING - WORKING SURFACES

29 CFR 1910.21

Subpart D

Definitions - Walking-Working Surfaces

(a) As used in 1910.23, unless the context requires otherwise, floor and wall opening, railing and toe board terms shall have the meanings ascribed in this paragraph.

(1) "Floor hole." An opening measuring less than 12 inches but more than 1 inch in its least dimension, in any floor, platform, pavement, or yard, through which materials but not persons may fall; such as a belt hole, pipe opening, or slot opening.

(2) "Floor opening." An opening measuring 12 inches or more in its least dimension, in any floor, platform, pavement, or yard through which persons may fall; such as a hatchway, stair or ladder opening, pit, or large manhole. Floor openings occupied by elevators, dumb waiters, conveyors, machinery, or containers are excluded from this subpart.

(3) "Handrail." A single bar or pipe supported on brackets from a wall or partition, as on a stairway or ramp, to furnish persons with a handhold in case of tripping.

(4) "Platform." A working space for persons, elevated above the surrounding floor or ground; such as a balcony or platform for the operation of machinery and equipment.

(5) "Runway." A passageway for persons, elevated above the surrounding floor or ground level, such as a footwalk along shafting or a walkway between buildings.

(6) "Standard railing." A vertical barrier erected along exposed edges of a floor opening, wall opening, ramp, platform, or runway to prevent falls of persons.

(7) "Standard strength and construction." Any construction of railings, covers, or other guards that meets the requirements of 1910.23.

(8) "Stair railing." A vertical barrier erected along exposed sides of a stairway to prevent falls of persons.

(9) "Toeboard." A vertical barrier at floor level erected along exposed edges of a floor opening, wall opening, platform, runway, or ramp to prevent falls of materials.

(10) "Wall hole." An opening less than 30 inches but more than 1 inch high,of unrestricted width, in any wall or partition; such as a ventilation hole or drainage scupper.

(11) "Wall opening." An opening at least 30 inches high and 18 inches wide,in any wall or partition, through which persons may fall; such as a yard-arm doorway or chute opening.

(b) As used in 1910.24, unless the context requires otherwise, fixed industrial stair terms shall have the meaning ascribed in this paragraph.

(1) "Handrail." A single bar or pipe supported on brackets from a wall or partition to provide a continuous handhold for persons using a stair.

(2) "Nose, nosing." That portion of a tread projecting beyond the face of the riser immediately below.

(3) "Open riser." The air space between the treads of stairways without upright members (risers).

(4) "Platform." An extended step or landing breaking a continuous run of stairs.

(5) "Railing." A vertical barrier erected along exposed sides of stairways and platforms to prevent falls of persons. The top member of railing usually serves as a handrail.

(6) "Rise." The vertical distance from the top of a tread to the top of the next higher tread.

(7) "Riser." The upright member of a step situated at the back of a lower tread and near the leading edge of the next higher tread.

(8) "Stairs, stairway." A series of steps leading from one level or floor to another, or leading to platforms, pits, boiler rooms, crossovers, or around machinery, tanks, and other equipment that are used more or less continuously or routinely by employees, or only occasionally by specific individuals. A series of steps and landings having three or more risers constitutes stairs or stairway.

(9) "Tread." The horizontal member of a step.

(10) "Tread run." The horizontal distance from the leading edge of a tread to the leading edge of an adjacent tread.

(11) "Tread width." The horizontal distance from front to back of tread including nosing when used.

(c) As used in 1910.25, unless the context requires otherwise, portable wood ladders terms shall have the meanings ascribed in this paragraph.

(1) "Ladders." A ladder is an appliance usually consisting of two side rails joined at regular intervals by cross-pieces called steps, rungs, or cleats, on which a person may step in ascending or descending.

(2) "Stepladder." A stepladder is a self-supporting portable ladder, nonadjustable in length, having flat steps and a hinged back. Its size is designated by the overall length of the ladder measured along the front edge of the side rails.

(3) "Single ladder." A single ladder is a non-self-supporting portable ladder, nonadjustable in length, consisting of but one section. Its size is designated by the overall length of the side rail.

(4) "Extension ladder." An extension ladder is a non-self-supporting portable ladder adjustable in length. It consists of two or more sections traveling in guides or brackets so arranged as to permit length adjustment. Its size is designated by the sum of the lengths of the sections measured along the side rails.

(5) "Sectional ladder." A sectional ladder is a non-self-supporting portable ladder, nonadjustable in length, consisting of two or more sections of ladder so constructed that the sections may be combined to function as a single ladder. Its size is designated by the overall length of the assembled sections.

(6) "Trestle ladder." A trestle ladder is a self-supporting portable ladder, nonadjustable in length, consisting of two sections hinged at the top to form equal angles with the base. The size is designated by the length of the side rails measured along the front edge.

(**7) "Extension trestle ladder."** An extension trestle ladder is a self-supporting portable ladder, adjustable in length, consisting of a trestle ladder base and a vertically adjustable single ladder, with suitable means for locking the ladders together. The size is designated by the length of the trestle ladder base.

(8) "Special-purpose ladder." A special-purpose ladder is a portable ladder which represents either a modification or a combination of design or construction features in one of the general-purpose types of ladders previously defined, in order to adapt the ladder to special or specific uses.

(9) "Trolley ladder." A trolley ladder is a semifixed ladder, nonadjustable in length, supported by attachments to an overhead track, the plane of the ladder being at right angles to the plane of motion.

(10) "Side-rolling ladder." A side-rolling ladder is a semifixed ladder, nonadjustable in length, supported by attachments to a guide rail, which is generally fastened to shelving, the plane of the ladder being also its plane of motion.

(**11) "Wood characteristics."** Wood characteristics are distinguishing features which by their extent and number determine the quality of a piece of wood.

(12) "Wood irregularities." Wood irregularities are natural characteristics in or on wood that may lower its durability, strength, or utility.

(13) "Cross grain." Cross grain (slope of grain) is a deviation of the fiber direction from a line parallel to the sides of the piece.

(**14) "Knot."** A knot is a branch or limb, imbedded in the tree and cut through in the process of lumber manufacture, classified according to size,quality, and occurrence. The size of the knot is determined as the average diameter on the surface of the piece.

(15) "Pitch and bark pockets." A pitch pocket is an opening extending parallel to the annual growth rings containing, or that has contained, pitch, either solid or liquid. A bark pocket is an opening between annual growth rings that contains bark.

(16) "Shake." A shake is a separation along the grain, most of which occurs between the rings of annual growth.

(17) "Check." A check is a lengthwise separation of the wood, most of which occurs across the rings of annual growth.

(18) "Wane." Wane is bark, or the lack of wood from any cause, on the corner of a piece.

(**19) "Decay."** Decay is disintegration of wood substance due to action of wood-destroying fungi. It is also known as dote and rot.

(20) "Compression failure." A compression failure is a deformation (buckling) of the fibers due to excessive compression along the grain.

(21) "Compression wood." Compression wood is an aberrant (abnormal) and highly variable type of wood structure occurring in softwood species. The wood commonly has density somewhat higher than does normal wood, but somewhat lower stiffness and tensile strength for its weight in addition to high longitudinal shrinkage.

(22) "Low density." Low-density wood is that which is exceptionally light in weight and usually deficient in strength properties for the species.

(d) As used in 1910.26, unless the context requires otherwise, portable metal ladder terms shall have the meanings ascribed in this paragraph.

(1) "Ladder." A ladder is an appliance usually consisting of two side rails joined at regular intervals by cross-pieces called steps, rungs, or cleats, on which a person may step in ascending or descending.

(2) "Step ladder." A step ladder is a self-supporting portable ladder, nonadjustable in length, having flat steps and a hinged back. Its size is designated by the overall length of the ladder measured along the front edge of the side rails.

(3) "Single ladder." A single ladder is a non-self-supporting portable ladder, nonadjustable in length, consisting of but one section. Its size is designated by the overall length of the side rail.

(4) "Extension ladder." An extension ladder is a non-self-supporting portable ladder adjustable in length. It consists of two or more sections traveling in guides or brackets so arranged as to permit length adjustment. Its size is designated by the sum of the lengths of the sections measured along the side rails.

(5) "Platform ladder." A self-supporting ladder of fixed size with a platform provided at the working level. The size is determined by the distance along the front rail from the platform to the base of the ladder.

(6) "Sectional ladder." A sectional ladder is a non-self-supporting portable ladder, non-adjustable in length, consisting of two or more sections so constructed that the sections may be combined to function as a single ladder. Its size is designated by the overall length of the assembled sections.

(7) "Trestle ladder." A trestle ladder is a self-supporting portable ladder, non-adjustable in length, consisting of two sections, hinged at the top to form equal angles with the base. The size is designated by the length of the side rails measured along the front edge.

(8) "Extension trestle ladder." An extension trestle ladder is a self-supporting portable ladder, adjustable in length, consisting of a trestle ladder base and a vertically adjustable single ladder, with suitable means for locking the ladders together. The size is designated by the length of the trestle ladder base.

(9) "Special-purpose ladder." A special-purpose ladder is a portable ladder which represents either a modification or a combination of design or construction features in one of the general-purpose types of ladders previously defined, in order to adapt the ladder to special or specific uses.

(e) As used in 1910.27, unless the context requires otherwise, fixed ladder terms shall have the meanings ascribed in this paragraph.

(1) "Ladder." A ladder is an appliance usually consisting of two side rails joined at regular intervals by cross-pieces called steps, rungs, or cleats, on which a person may step in ascending or descending.

(2) "Fixed ladder." A fixed ladder is a ladder permanently attached to a structure, building, or equipment.

(3) "Individual-rung ladder." An individual-rung ladder is a fixed ladder each rung of which is individually attached to a structure, building, or equipment.

(4) "Rail ladder." A rail ladder is a fixed ladder consisting of side rails joined at regular intervals by rungs or cleats and fastened in full length or in sections to a building, structure, or equipment.

(5) "Railings". A railing is any one or a combination of those railings constructed in accordance with 1910.23. A standard railing is a vertical barrier erected along exposed edges of floor openings, wall openings, ramps, platforms, and runways to prevent falls of persons.

(6) "Pitch." Pitch is the included angle between the horizontal and the ladder, measured on the opposite side of the ladder from the climbing side.

(7) "Fastenings." A fastening is a device to attach a ladder to a structure, building, or equipment.

(8) "Rungs." Rungs are ladder cross-pieces of circular or oval cross-section on which a person may step in ascending or descending.
(9) "Cleats." Cleats are ladder cross-pieces of rectangular cross-section placed on edge on which a person may step in ascending or descending.

(10) "Steps." Steps are the flat cross-pieces of a ladder on which a person may step in ascending or descending.

(11) "Cage." A cage is a guard that may be referred to as a cage or basket guard which is an enclosure that is fastened to the side rails of the fixed ladder or to the structure to encircle the climbing space of the ladder for the safety of the person who must climb the ladder.

(12) "Well." A well is a permanent complete enclosure around a fixed ladder, which is attached to the walls of the well. Proper clearances for a well will give the person who must climb the ladder the same protection as a cage.

(13) "Ladder safety device." A ladder safety device is any device, other than a cage or well, designed to eliminate or reduce the possibility of accidental falls and which may incorporate such features as life belts, friction brakes, and sliding attachments.

(14) "Grab bars." Grab bars are individual handholds placed adjacent to or as an extension above ladders for the purpose of providing access beyond the limits of the ladder.

(15) "Through ladder." A through ladder is one from which a man getting off at the top must step through the ladder in order to reach the landing.

(16) "Side-step ladder." A side-step ladder is one from which a man getting off at the top must step sideways from the ladder in order to reach the landing.

(f) As used in 1910.28, unless the context requires otherwise, scaffolding terms shall have the meaning ascribed in this paragraph.

(1) "Bearer." A horizontal member of a scaffold upon which the platform rests and which may be supported by ledgers.

(2) "Boatswain's chair." A seat supported by slings attached to a suspended rope, designed to accommodate one workman in a sitting position.

(3) **"Brace."** A tie that holds one scaffold member in a fixed position with respect to another member.

(4) "Bricklayers' square scaffold." A scaffold composed of framed wood squares which support a platform limited to light and medium duty.

(5) "Carpenters' bracket scaffold." A scaffold consisting of wood or metal brackets supporting a platform.

(6) "Coupler." A device for locking together the component parts of a tubular metal scaffold. The material used for the couplers shall be of a structural type, such as a drop-forged steel, malleable iron, or structural grade aluminum. The use of gray cast iron is prohibited.

(7) "Crawling board or chicken ladder." A plank with cleats spaced and secured at equal intervals, for use by a worker on roofs, not designed to carry any material.

(8) "Double pole or independent pole scaffold." A scaffold supported from the base by a double row of uprights, independent of support from the walls and constructed of uprights, ledgers, horizontal platform bearers, and diagonal bracing.

(9) "Float or ship scaffold." A scaffold hung from overhead supports by means of ropes and consisting of a substantial platform having diagonal bracing underneath, resting upon and securely fastened to two parallel plank bearers at right angles to the span.

(10) "Guardrail." A rail secured to uprights and erected along the exposed sides and ends of platforms.

(11) "Heavy duty scaffold." A scaffold designed and constructed to carry a working load not to exceed 75 pounds per square foot.

(12) "Horse scaffold." A scaffold for light or medium duty, composed of horses supporting a work platform.

(13) "Interior hung scaffold." A scaffold suspended from the ceiling or roof structure.

(14) "Ladder jack scaffold." A light duty scaffold supported by brackets attached to ladders.

(15) "Ledger (stringer)." A horizontal scaffold member which extends from post to post and which supports the putlogs or bearer forming a tie between the posts.

(16) "Light duty scaffold." A scaffold designed and constructed to carry a working load not to exceed 25 pounds per square foot.

(17) "Manually propelled mobile scaffold." A portable rolling scaffold supported by casters.

(18) "Masons' adjustable multiple-point suspension scaffold." A scaffold having a continuous platform supported by bearers suspended by wire rope from overhead supports, so arranged and operated as to permit the raising or lowering of the platform to desired working positions.

(19) "Maximum intended load." The total of all loads including the working load, the weight of the scaffold, and such other loads as may be reasonably anticipated.

(20) "Medium duty scaffold." A scaffold designed and constructed to carry a working load not to exceed 50 pounds per square foot.

(21) "Mid-rail." A rail approximately midway between the guardrail and platform, used when required, and secured to the uprights erected along the exposed sides and ends of platforms.

(22) "Needle beam scaffold." A light duty scaffold consisting of needle beams supporting a platform.

(23) "Outrigger scaffold." A scaffold supported by outriggers or thrustouts projecting beyond the wall or face of the building or structure, the inboard ends of which are secured inside of such a building or structure.

(24) "Putlog." A scaffold member upon which the platform rests.

(25) "Roofing bracket." A bracket used in sloped roof construction, having provisions for fastening to the roof or supported by ropes fastened over the ridge and secured to some suitable object.

(26) "Runner." The lengthwise horizontal bracing or bearing members or both.

(27) "Scaffold." Any temporary elevated platform and its supporting structure used for supporting workmen or materials or both.

(28) "Single-point adjustable suspension scaffold." A manually or power-operated unit designed for light duty use, supported by a single wire rope from an overhead support so arranged and operated as to permit the raising or lowering of the platform to desired working positions.

(29) "Single pole scaffold." Platforms resting on putlogs or crossbeams, the outside ends of which are supported on ledgers secured to a single row of posts or uprights and the inner ends of which are supported on or in a wall.
(30) "Stone setters" adjustable multiple-point suspension scaffold." A swinging-type scaffold having a platform supported by hangers suspended at four points so as to permit the raising or lowering of the platform to the desired working position by the use of hoisting machines.

(31) "Toeboard." A barrier secured along the sides and ends of a platform, to guard against the falling of material.

(32) "Tube and coupler scaffold." An assembly consisting of tubing which serves as posts, bearers, braces, ties, and runners, a base supporting the posts, and special couplers which serve to connect the uprights and to join the various members.

(33) "Tubular welded frame scaffold." A sectional, panel, or frame metal scaffold substantially built up of prefabricated welded sections which consist of posts and horizontal bearer with intermediate members. Panels or frames shall be braced with diagonal or cross braces.

(34) "Two-point suspension scaffold (swinging scaffold)." A scaffold, the platform of which is supported by hangers (stirrups) at two points, suspended from overhead supports so as to permit the raising or lowering of the platform to the desired working position by tackle or hoisting machines.

(35) "Window jack scaffold." A scaffold, the platform of which is supported by a bracket or jack which projects through a window opening.

(36) "Working load." Load imposed by men, materials, and equipment.

(g) As used in 1910.29, unless the context requires otherwise, manually propelled mobile ladder stand and scaffold (tower) terms shall have the meaning ascribed in this paragraph.

(1) "Bearer." A horizontal member of a scaffold upon which the platform rests and which may be supported by ledgers.

(2) "Brace." A tie that holds one scaffold member in a fixed position with respect to another member.

(3) "Climbing ladder." A separate ladder with equally spaced rungs usually attached to the scaffold structure for climbing and descending.

(4) "Coupler." A device for locking together the components of a tubular metal scaffold which shall be designed and used to safely support the maximum intended loads.

(5) "Design working load." The maximum intended load, being the total of all loads including the weight of the men, materials, equipment, and platform.

(6) "Equivalent." Alternative design or features, which will provide an equal degree or factor of safety.

(7) "Guardrail." A barrier secured to uprights and erected along the exposed sides and ends of platforms to prevent falls of persons.

(8) "Handrail." A rail connected to a ladder stand running parallel to the slope and/or top step.

(9) "Ladder stand." A mobile fixed size self-supporting ladder consisting of a wide flat tread ladder in the form of stairs. The assembly may include handrails.

(10) "Ledger (stringer)." A horizontal scaffold member which extends from post to post and which supports the bearer forming a tie between the posts.

(11) "Mobile scaffold (tower)." A light, medium, or heavy duty scaffold mounted on casters or wheels.

(12) "Mobile." "Manually propelled."

(13) "Mobile work platform." Generally a fixed work level one frame high on casters or wheels, with bracing diagonally from platform to vertical frame.

(14) "Runner." The lengthwise horizontal bracing and/or bearing members.

(15) "Scaffold." Any temporary elevated platform and its necessary vertical, diagonal, and horizontal members used for supporting workmen and materials. (Also known as a scaffold tower.)

(16) "Toeboard." A barrier at platform level erected along the exposed sides and ends of a scaffold platform to prevent falls of materials.

(17) "Tube and coupler scaffold." An assembly consisting of tubing which serves as posts, bearers, braces, ties, and runners, a base supporting the posts, and uprights, and serves to join the various members, usually used in fixed locations.

(18) "Tubular welded frame scaffold." A sectional, panel, or frame metal scaffold substantially built up of prefabricated welded sections, which consist of posts and bearers with intermediate connecting members and braced with diagonal or cross braces.

(19) "Tubular welded sectional folding scaffold." A sectional, folding metal scaffold either of ladder frame or inside stairway design, substantially built of prefabricated welded sections, which consist of end frames, platform frame, inside inclined stairway frame and braces, or hinged connected diagonal and horizontal braces, capable of being folded into a flat package when the scaffold is not in use.

(20) "Work level." The elevated platform, used for supporting workmen and their materials, comprising the necessary vertical, horizontal, and diagonal braces, guardrails, and ladder for access to the work platform.

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Subpart D

Walking - Working Surfaces

1910.22 General Requirements.

This section applies to all permanent places of employment, except where domestic, mining, or agricultural work only is performed. Measures for the control of toxic materials are considered to be outside the scope of this section.

(a) "Housekeeping."

(1) All places of employment, passageways, storerooms, and service rooms shall be kept clean and orderly and in a sanitary condition.

(2) The floor of every workroom shall be maintained in a clean and, so far as possible, a dry condition. Where wet processes are used, drainage shall be maintained, and false floors, platforms, mats, or other dry standing places, should be provided where practicable.

(3) To facilitate cleaning, every floor, working place, and passageway shall be kept free from protruding nails, splinters, holes, or loose boards.

(b) "Aisles and passageways"

(1) Where mechanical handling equipment is used, sufficient safe clearances shall be allowed for aisles, at loading docks, through doorways and wherever turns or passage must be made. Aisles and passageways shall be kept clear and in good repairs, with no obstruction across or in aisles that could create a hazard.

(2) Permanent aisles and passageways shall be appropriately marked.

(c) "Covers and guardrails" Covers and/or guardrails shall be provided to protect personnel from the hazards of open pits, tanks, vats, ditches, etc.

(d) "Floor loading protection"

(1) In every building or other structure, or part thereof, used for mercantile, business, industrial, or storage purposes, the loads approved by the building official shall be marked on plates of approved design which shall be supplied and securely affixed by the owner of the building, or his duly authorized agent, in a conspicuous place in each space to which they relate. Such plates shall not be removed or defaced but, if lost, removed, or defaced, shall be replaced by the owner or his agent.

(2) It shall be unlawful to place, or cause, or permit to be placed, on any floor or roof of a building or other structure a load greater than that for which such floor or roof is approved by the building official.

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Subpart D

Walking - Working Surfaces

1910.23 Guarding Floor and Wall Openings and Holes

(a) "Protection for floor openings."

(1) Every stairway floor opening shall be guarded by a standard railing constructed in accordance with paragraph (e) of this section. The railing shall be provided on all exposed sides (except at entrance to stairway). For infrequently used stairways where traffic across the opening prevents the use of fixed standard railing (as when located in aisle spaces, etc.), the guard shall consist of a hinged floor opening cover of standard strength and construction and removable standard railings on all exposed sides (except at entrance to stairway).

(2) Every ladderway floor opening or platform shall be guarded by a standard railing with standard toeboard on all exposed sides (except at entrance to opening), with the passage through the railing either provided with a swinging gate or so offset that a person cannot walk directly into the opening.

(3) Every hatchway and chute floor opening shall be guarded by one of the following:

(i) Hinged floor opening cover of standard strength and construction equipped with standard railings or permanently attached thereto so as to leave only one exposed side. When the opening is not in use, the cover shall be closed or the exposed side shall be guarded at both top and intermediate positions by removable standard railings.

(ii) A removable railing with toeboard on not more than two sides of the opening and fixed standard railings with toeboards on all other exposed sides. The removable railings shall be kept in place when the opening is not in use. Where operating conditions necessitate the feeding of material into any hatchway or chute opening, protection shall be provided to prevent a person from falling through the opening.

(4) Every skylight floor opening and hole shall be guarded by a standard skylight screen or a fixed standard railing on all exposed sides,

(5) Every pit and trapdoor floor opening, infrequently used, shall be guarded by a floor opening cover of standard strength and construction. While the cover is not in place, the pit or trap opening shall be constantly attended by someone or shall be protected on all exposed sides by removable standard railings.

(6) Every manhole floor opening shall be guarded by a standard manhole cover which need not be hinged in place. While the cover is not in place, the manhole opening shall be constantly attended by someone or shall be protected by removable standard railings.

(7) Every temporary floor opening shall have standard railings, or shall be constantly attended by someone.

(8) Every floor hole into which persons can accidentally walk shall be guarded by either:

(i) A standard railing with standard toeboard on all exposed sides, or

(ii) A floor hole cover of standard strength and construction. While the cover is not in place, the floor hole shall be constantly attended by someone or shall be protected by a removable standard railing,

(9) Every floor hole into which persons cannot accidentally walk (on account of fixed machinery, equipment, or walls) shall be protected by a cover that leaves no openings more than I inch wide. The cover shall be securely held in place to prevent tools or materials from falling through

(10)) Where doors or gates open directly on a stair-way, a platform shall be provided, and the swing of the door shall not reduce the effective width to less than 20 inches.

(b) "Protection for wall openings and holes." (1) Every wall opening from which there is a drop of more than 4 feet shall be guarded by one of the following:

(i) Rail, roller, picket fence, half door, or equivalent barrier. Where there is exposure below to falling materials, a removable toe board or the equivalent shall also be provided. When the opening is not in use for handling materials, the board shall be kept in position regardless of a door on the opening. In addition, a grab handle shall be provided on each side of the opening with its center approximately 4 feet above floor level and of standard strength and mounting.

(ii) Extension platform onto which materials can be hoisted for handling, and which shall have side rails or equivalent guards of standard specifications.

(2) Every chute wall opening from which there is a drop of more than 4 feet shall be guarded by one or more of the barriers specified in paragraph (b)(1) of this section or as required by the conditions.

(3) Every window wall opening at a stairway landing, floor, platform, or balcony, from which there is a drop of more than 4 feet, and where the bottom of the opening is less than 3 feet above the platform or landing, shall be guarded by standard slats, standard grill work (as specified in paragraph (e)(11) of this section), or standard railing. Where the window opening is below the landing, or platform, a standard toe board shall be provided.

(4) Every temporary wall opening shall have adequate guards but these need not be of standard construction.

(5) Where there is a hazard of materials falling through a wall hole, and the lower edge of the near side of the hole is less than 4 inches above the floor, and the far side of the hole more than 5 feet above the next lower level, the hole shall be protected by a standard toeboard, or an enclosing screen either of solid construction, or as specified in paragraph (e)(I1) of this section.

(c) "Protection of open-sided floors, platforms, and runways." (1) Every open-sided floor or platform 4 feet or more above adjacent floor or ground level shall be guarded by a standard railing (Or the equivalent as specified in paragraph (e)(3) of this section) on all open sides except where there is entrance to a ramp, stairway, or fixed ladder. The railing shall be provided with a toeboard wherever, beneath the open sides,

(I) Persons can pass,

(ii) There is moving machinery, or

(iii) There is equipment with which failing materials could create a hazard.

(2) Every runway shall be guarded by a standard railing (or the equivalent as specified in paragraph (e)(3) of this section) on all open sides 4 feet or more above floor or ground level. Wherever tools, machine parts, or materials are likely to be used on the runway, a toeboard shall also be provided on each exposed side.
Runways used exclusively for special purposes (such as oiling, shafting, or filling tank cars) may have the railing On One side omitted where operating conditions necessitate such omission, providing the failing hazard is minimized by using a runway of not less than 18 inches wide. Where persons entering upon runways become thereby exposed to machinery, electrical equipment, or other danger not a failing hazard, additional guarding than is here specified may be essential for protection

(3) Regardless of height, open-sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment, pickling or galvanizing tanks, degreasing units, and similar hazards shall be guarded with a standard railing and toe board.

(d) "Stairway railings and guards." (1) Every flight of stairs having four or more risers shall be equipped with standard stair railings or standard handrails as specified in paragraphs (d)(1)(i) through (v) of this section. the width of the stair to be measured clear of all obstructions except handrails:

(i) On stairways less than 44 inches wide having both sides enclosed, at least one handrail, preferably on the tight side descending.

(ii) On stairways less than 44 inches wide having one side open, at least one stair railing on open side.

(iii) On stairways less than 44 inches wide having both sides open, one stair railing on each side.

(iv) On stairways more than 44 inches wide but less- than 98 inches wide, one handrail on each enclosed side and one stair railing on each open side.

(v) On stairways 88 or more inches wide, one handrail on each enclosed side, one stair railing on each open side, and one intermediate stair railing located approximately midway of the width.

(2) Winding stairs shall be equipped with a handrail offset to prevent walking on all portions of the treads having width less than 6 inches.

(e) "Railing, toe boards, and cover specifications." (1) A standard railing shall consist of top rail, intermediate rail, and posts, and shall have a vertical height of 42 inches nominal from upper surface of top rail to floor, platform, runway, or ramp level. The top rail shall be smooth-surfaced throughout the length of the railing. The intermediate rail shall be approximately halfway between the top rail and the floor, platform, runway, or ramp.

(f) The ends of the rails shall not overhang the terminal posts except where such overhang does not constitute a projection hazard.

(2) A stair railing shall be of construction similar to a standard railing but the vertical height shall be not more than 34 inches nor less than 10 inches from upper surface of top rail to surface of tread in line with face of riser at forward edge of tread.

(3) [Reserved]

(I) For wood railings, the posts shall be of at least 2-inch by 4-inch stock spaced not to exceed 6 feet, the top and intermediate rails shall be of at least 2-inch by 4-inch stock- If top rail is made of two right-angle pieces of 1-inch by 4-inch stock, posts may be spaced on 8-foot centers, with 2-inch by 4-inch intermediate rail.

(ii) For pipe railings, posts and top and intermediate railings shall be at least 1 1/2 inches nominal diameter with posts spaced not more than 8 feet on centers.

(iii) For structural steel railings, posts and top and intermediate rails shall be of 2-inch by 2-inch by '3/8-inch angles or other metal shapes of equivalent bending strength with posts spaced not more than 8 feet on centers.

(iv) The anchoring of posts and framing of members for railings of all types shall be of such construction that the completed structure shall be capable of withstanding a load of at least 200 pounds applied in any direction at any point on the top rail.

(v) Other types, sizes, and arrangements of railing construction are acceptable provided they meet the following conditions.

{*a*} A smooth-surfaced top rail at a height above floor, platform, runway, or ramp level of 42 inches nominal;

{*b*} A strength to withstand at least the minimum requirement of 200 pounds top rail pressure;

{*c*} Protection between top rail and floor, platform, runway, ramp, or stair treads, equivalent at least to that afforded by a standard intermediate rail;

(4) A standard toeboard shall be 4 inches nominal in vertical height from its top edge to the level of the floor, platform, runway, or ramp. It shall be securely fastened in place and with not more than 1/4-inch clearance above floor level.

(5) It may be made of any substantial material either solid or with openings not over I inch in greatest dimension. Where material is piled to such height that a standard toeboard does not provide protection, paneling from floor to intermediate rail, or to top rail shall be provided.

(i) A handrail shall consist of a lengthwise member mounted directly on a wall or partition by means of brackets attached to the lower side of the handrail so as to offer no obstruction to a smooth surface along the top and both sides of the handrail. The handrail shall be of rounded or other section that will furnish an adequate handhold for anyone grasping it to avoid falling. The ends of the handrail should be turned in to the supporting wall or otherwise arranged so as not to constitute a projection hazard.

(ii) The height of handrails shall be not more than 34 inches nor less than 30 inches from upper surface of handrail to surface of tread in line with face of riser or to surface of ramp.

(iii) The size of handrails shall be: When of hardwood, at least 2 inches in diameter; when of metal pipe, at least 1 1/2 inches in diameter. The length of brackets shall be such as will give a clearance between handrail and wall Or any projection thereon of at least 3 inches. The spacing of brackets shall not exceed 8 feet.

(iv) The mounting of handrails shall be such that the completed structure is capable of withstanding a load of at least 200 pounds applied in any direction at any point on the rail.

(6) All handrails and tailings shall be provided with a clearance of not less than 3 inches between the handrail or railing and any other object.

(7) Floor opening covers may be of any material that Meets the following strength requirements:

(I) Trench or conduit covers and their supports, when located in plant roadways, shall be designed to carry a truck rear-axle load of at least 20,000 pounds.

(ii) Manhole covers and their supports, when located in plant roadways, shall comply with local standard highway requirements if any; otherwise, they shall be designed to carry a truck rear-axle load of at least 20,000 pounds.

(iii) The construction of floor opening covers may be of any material that meets the strength requirements.

Covers projecting not more than I inch above the floor level may be used providing all edges are chambered it) an angle with the horizontal of not over 30 degrees. All hinges, handles, bolts, or other parts shall set flush with the floor or cover surface.

(8) Skylight screens shall be of such construction and mounting that they arc capable of withstanding a load of at least 200 pounds applied perpendicularly at any one area on the screen. They shall also be of such construction and mounting that under ordinary loads or impact, they will not deflect downward sufficiently to break the glass below them. The construction shall be of grillwork with openings not more than 4 inches long or slatwork with openings not more than 2 inches wide with length unrestricted.

(9) Wall opening barriers (rails, rollers, picket fences, and half doors) shall be of such construction and mounting that, when in place at the opening, the barrier is capable of withstanding a load of at least 200 pounds applied in any direction (except upward) at any point on the top rail or corresponding member.

(10) Wall opening grab handles shall be not less than 12 inches in length and shall be so mounted as to give 3 inches clearance from the side framing of the wall opening. The size, material, and anchoring of the grab handle shall be such that the completed structure is capable of withstanding a load of at least 200 pounds applied in any direction at any point of the handle.

(11) Wall opening screens shall be of such construction and mounting that they are capable of withstanding a load of at least 200 pounds applied horizontally at any point on the near side of the screen. They may be of solid construction, of grillwork with openings not more than 8 inches long, or of slatwork with openings not more than 4 inches wide with length unrestricted.

[39 FR 23502, June 27, 1974, as amended at 43 FR 49744, Oct. 24, 1978;
49 FR 5321, Feb. 10, 19841]

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Subpart D

Walking - Working Surfaces

1910.24 Fixed Industrial Stairs.

(a) "Application of requirements." This section contains specifications for the safe design and construction of fixed general industrial stairs. This classification includes interior and exterior stairs around machinery, tanks, and other equipment, and stairs leading to or from floors, platforms, or pits. This section does not apply to stairs used for fire exit purposes, to construction operations to private residences, or to articulated stairs, such as may be installed on floating roof tanks or on dock facilities, the angle of which changes with the rise and fall of the base support.

(b) "Where fixed stairs are required." Fixed stairs shall be provided for access from one structure level to another where operations necessitate regular travel between levels, and for access to operating platforms at any equipment which requires attention routinely during operations. Fixed stairs shall also be provided where access to elevations is daily or at each shift for such purposes as gauging, inspection, regular maintenance, etc., where such work may expose employees to acids, caustics, gases, or other harmful substances, or for which purposes the carrying of tools or equipment by hand is normally required. (It is not the intent of this section to preclude the use of fixed ladders for access to elevated tanks, towers, and similar structures, overhead traveling cranes, etc., where the use of fixed ladders is common practice.) Spiral stairways shall not be permitted except for special limited usage and secondary access situations where it is not practical to provide a conventional stairway. Winding stairways may be installed on tanks and similar round structures where the diameter of the structure is not less
than five (5) feet.

(c) "Stair strength." Fixed stairways shall be designed and constructed to carry a load of five times the normal live load anticipated but never of less strength than to carry safely a moving concentrated load of 1,000 pounds.

(d) "Stair width" Fixed stairways shall have a minimum width of 22 inches.

(e) "Angle of stairway rise." Fixed stairs shall be installed at angles to the horizontal of between 30 deg. and 50 deg. Any uniform combination of rise/tread dimensions may be used that will result in a stairway way at an angle to the horizontal within the permissible range. Table D- 1 gives rise/tread dimensions which will produce a stairway within the permissible range, stating the angle to the horizontal produced by each combination. However, the rise/tread combinations are not limited to those given in Table D-1,

Table D-1

Angle to horizontal	Rise (in inches)	Tread run (in inches)
3Odeg. 35’	6 1/2	11
32 deg. 08’	6 3/4	10 3/4
33 deg. 41’	7	10 1/2
35 deg. 6'...	7 1/4	10 1/4
36 deg. 52’	71/2	10
38 deg. 29’	73/4	9 3/4
40 deg. 08'	8	9 1/2
41 deg. 44	8 1/4	9 1/4
43 deg. 22...	8 1/2	9
45 deg. 00	8 3/4	8 3/4
46 deg. 38	9	8 1/2
48 deg. 16	9 1/4	8 1/4
49 deg. 54	9 1/2	8

(f) "Stair treads." All treads shall be reasonably slip-resistant and the nosings shall be of nonslip finish. Welded bar grating treads without nosings are acceptable providing the leading edge can be readily identified by personnel descending the stairway and provided the tread is serrated or is of definite nonslip design. Rise height and tread width shall be uniform throughout any flight of stairs including any foundation structure used as one or more treads of the stairs.

(g) "Stairway platforms." Stairway platforms shall be no less than the width of a stairway and a minimum of 30 inches in length measured in the direction of travel.

(h) "Railings and handrails." Standard railings shall be provided on the open sides of all exposed stairways and stair platforms- Handrails shall be provided on at least one side of closed stairways preferably on the right side descending. Stair railings and handrails shall be installed in accordance with the provisions of 1910,23.

(i) "Vertical clearance." Vertical clearance above any stair tread to an overhead obstruction shall be at least 7 feet measured from the leading edge of the tread.

[39 FR 23502, June 27, 1974, as amended at 43 FR 49744, Oct. 24, 1978; 49 FR 532 1, Feb. 10, 19841

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Subpart D

Walking - Working Surfaces

1910.25 Portable Wood Ladders

(a) "Application of requirements." This section is intended to prescribe rules and establish minimum requirements for the construction, care, and use of the common types of portable wood ladders, in order to insure safety under normal conditions of usage. Other types of special ladders, fruitpickers ladders, combination step and extension ladders, stockroom step ladders, aisle-way step ladders, shelf ladders, and library ladders are not specifically covered by this section.

(b) "Materials" (1) "Requirements applicable to all wood parts."

(i) All wood parts shall be free from sharp edges and splinters; sound and free from accepted visual inspection from shake, wane, compression failures, decay, or other irregularities. Low density wood shall not be used.

(c) "Construction requirements."

(1) [Reserved]

(1) "*Portable stepladders*." Stepladders longer than 20 feet shall not be supplied. Stepladders as hereinafter specified shall be of three types:

NOTE: Reference the ANSI Standards ANSI A-14

Type I - A Industrial stepladder, 3 to 20 feet for heavy duly, such as utilities, contractors, and industrial use.

Type 11 - Commercial stepladder, 3 to 12 feet for medium duty, such as painters, offices, and light industrial use.

Type III - Household stepladder, 3 to 6 feet for light duty, such as light household use .

(i) "*General requirements.*"

{*a*} [Reserved]

{*b*} A uniform step spacing shall be employed which shall be not more than 12 inches. Steps shall be parallel and level when the ladder is in position for use.

{*c*)}The minimum width between side tails at the top, inside to inside, shall be not less than 11 1/2 inches. From top to bottom, the side rails shall spread at least I inch for each foot of length of stepladder.

{d} - {e} [*Reserved*]

{f} A metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in open positions shall be a component of each stepladder.
The spreader shall have all sharp points covered or removed to protect the user.
For Type III ladder, the pail shelf and spreader may be combined in one unit
(the so-called shelf-lock ladder).

(3) *Portable rung ladders*."

(I) Reserved

(ii) "*Single ladder*," {a} Single ladders longer than 30 feet shall not be supplied.

(iii) "*Two-section ladder*." {a}Two-section extension ladders longer than 60 feet shall not be supplied, All ladders of this type shall consist of two sections, one to fit within the side rails of the other, and arranged in such a manner that the upper section can be raised and lowered.

(iv) "*Sectional ladder*." {a} Assembled combinations of sectional ladders longer than lengths specified in this subdivision shall not be used.

(v) "*Trestle and extension trestle ladder*." {a} Trestle ladders, or extension sections or base sections of extension trestle ladders longer than 20 feet shall not be supplied.

(4) "*Special-purpose ladders*."

(i) [Reserved]

(ii) "*Painter's stepladder*." {a} Painter's stepladders longer than 12 feet shall not be supplied.

(iii) "*Mason's ladder*." A mason's ladder is a special type of single ladder intended for use in heavy construction work.

{a} Mason's ladders longer than 40 feet shall not be supplied.

(5) "*Trolley and side-rolling ladders*" - (i) "*Length*." Trolley ladders and side-rolling ladders longer than 20 feet should not be supplied.

(d) "Care and use of ladders" - (1) "*Care*." To insure safety and serviceability the following precautions on the care of ladders shall be observed:

(i) Ladders shall be maintained in good condition at all times, the joint between the steps and side rails shall be tight, all hardware and fittings securely attached, and the movable parts shall operate freely without binding or undue play.

(ii) Metal bearings of locks, wheels, pulleys, etc., shall be frequently lubricated.

(iii) Frayed or badly worn rope shall be replaced.

(iv) Safety feet and other auxiliary equipment shall be kept in good condition to insure proper performance.

(v)-(ix) [Reserved]

(x) Ladders shall be inspected frequently and those which have developed defects shall be withdrawn from service for repair or destruction and tagged or marked as "Dangerous, Do Not Use."

(xi) Rungs should be kept free of grease and oil.

(2) "*Use*." The following safety precautions shall be observed in connection with the use of ladders:

(i) Portable rung and cleat ladders shall, ,where possible, be used at such a pitch that the horizontal distance from the top support to the foot of the ladder is one-quarter of the working length of the ladder (the length along the ladder between the foot and the. top support). The ladder shall be so placed as to prevent slipping, or it shall be lashed, or held in position. Ladders shall not be used in a horizontal position as platforms, runways, or scaffolds;

(ii) Ladders for which dimensions are specified should not be used by more than one man at a time nor with ladder jacks and scaffold planks where use by more than one man is anticipated. In such cases, specially designed ladders with larger dimensions of the parts should be procured;

(iii) Portable ladders shall be so placed that the side rails have a secure footing. The top rest for portable rung and cleat ladders shall be reasonably rigid and shall have ample strength to support the applied load;

(iv**)** Ladders shall not be placed in front of doors opening toward the ladder unless the door is blocked upon, locked, or guarded;

(v) Ladders shall not be placed on boxes, barrels, or other unstable bases to obtain additional height;

(viii) Ladders with broken or missing steps, rungs, or cleats, broken side rails, or other faulty equipment shall not be used; improvised repairs shall not be made;

(ix) Short ladders shall not be spliced together to provide long sections;

(x) Ladders made by fastening cleats across a single rail shall not be used.

(xi) Ladders shall not be used as guys, braces, or skids, or for other than their intended purposes,

(xii) Tops of the ordinary types of stepladders shall not be used as steps

(Xiii) On two-section extension ladders the minimum overlap for the two sections in use shall be as follows:

Size of ladder (feet)	Overlap (feet)
Up to and including 36.....	3
Over 36 up to and including 48.....	4
Over 48 up to and including 60.....	*5*

(xiv) Portable rung ladders with reinforced rails (see paragraphs (c)(3) (ii)(c) and (iii)(d) this section) shall be used only with the metal reinforcement on the under side;

(xv) No ladder should be used to gain access to a roof unless the top of the ladder shall extend at least 3 feet above the point of support, at eave, skitter, or roofline;

(xvi) [Reserved]

(xvii) Middle and top sections of sectional or window cleaners ladders should not be used for bottom section unless the user equips them with safety shoes,

(xviii) [Reserved]

(xix) The user should equip all portable rung ladders with nonslip bases when there is a hazard of slipping. Nonslip bases are not intended as a substitute for care in safely placing, lashing, or holding a ladder that is being used upon oily, metal, concrete, Or slippery surfaces,

(xx) The bracing on the back legs of stop ladders is designed solely for increasing stability and not for climbing.

[39 FR 23-502, June 27, 1974, as amended at 43 FR 49744, Oct. 24, 1978; 49 FR 5321, Feb. 10, 1984]

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Walking - Working Surfaces

1910.26 Portable Metal Ladders.

(a) "Requirements" - (1) "General." Specific design and construction requirements are not part of this section because of the wide variety of metals and design possibilities. However, the design shall be such as to produce a ladder without structural defects or accident hazards such as sharp edges, burrs, etc. The metal selected shall be of sufficient strength to meet the test requirements, and shall be protected against corrosion unless inherently corrosion-resistant.

(I) - (ii) [Reserved]

(iii) The spacing of rungs or steps shall be on 12-inch centers.

(iv) [Reserved]

(v) Rungs and steps shall be corrugated, knurled, dimpled, coated with skid-resistant material, or otherwise treated to minimize the possibility of slipping.

(2) "*General specifications - straight and extension ladders*." (i) The width between side rails of a straight ladder or any section of an extension ladder shall be 12 inches.

(ii) The length of single ladders or individual sections of ladders shall not exceed 30 feet. Two-section ladders shall not exceed 48 feet in length and over two-section ladders shall not exceed 60 feet in length.

(iii) Based on the nominal length of the ladder, each section of a multisection ladder shall overlap the adjacent section by at least the number of feet stated in the following:

Normal length of ladder (feet)	Overlap (feet)
Up to and including 36.....	3
Over 36, up to and including 48....	4

Over 48, up to 60..... 5

(iv) Extension ladders shall be equipped with positive stops which will insure the overlap specified in the table above.

(3) "*General specifications - step ladders*."

(i)-(ii) [Reserved]

(iii) The length of a stepladder is measured by the length of the front raiI. To be classified as a standard length ladder, the measured length shall be within plus or minus one-half inch of the specified length. Stepladders shall not exceed 20 feet in length.

(iv)-(vi) [Reserved]

(vii)The bottoms of the four rails are to be supplied with insulating non-slip material for the safety of the user.

(viii) A metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in the open position shall be a component of each stepladder. The spreader shall have all sharp points or edges covered or removed to protect the user.

(4) "*General specifications - trestles and extension trestle ladders*."

(i) Trestle ladders or extension sections or base sections of extension trestle ladders shall be not more than 20 feet in length.

(5) "General specifications - platform ladders." (i) The length of a platform ladder shall not exceed 20 feet. The length of a platform ladder shall be measured along the front rail from the floor to the platform.

(b) [Reserved]

(c) "Care and maintenance of ladders" - (1) "*General*." To get maximum serviceability, safety, and to eliminate unnecessary damage of equipment, good safe practices in the use and care of ladder equipment must be employed by the users.
The following rules and regulations are essential to the life of the equipment and the safety of the user.

(2) "*Care of ladders*."

(i)-(iii) [Reserved]

(iv) Ladders must be maintained in good usable condition at all times.

(v)[Reserved]

(vi)If a ladder is involved in any of the following, immediate inspection is necessary:
(*a*) If ladders tip over, inspect ladder for side rails dents or bends, or excessively dented rungs; check all rung-to-side-rail connections; check hardware connections; check rivets for shear.

(*b*)-(*c*) [Reserved]

(*d*) If ladders are exposed to oil and grease, equipment should be cleaned of oil, grease, or slippery materials. This can easily be done with a solvent or steam cleaning.

(vii) Ladders having defects are to be marked and taken out of service until repaired by either maintenance department or the manufacturer.

(3) "*Use of ladders*." (i). A simple rule for setting up a ladder at the proper angle is to place the base a distance from the vertical wall equal to one-fourth the working length of the ladder. (ii) Portable ladders are designed as a one-man working ladder based on a 200-pound load.

(iii) The ladder base section must be placed with a secure footing.

(iv) The top of the ladder must be placed with the two rails supported, unless equipped with a single support attachment.

(v) When ascending or descending, the climber must face the ladder.

(vi) Ladders must not be tied or fastened together to provide longer sections. They must be equipped with the hardware fittings necessary if the manufacturer endorses extended uses. (vii) Ladders should not be used as a brace, skid, guy or gin pole, gangway, or for other uses than that for which they were intended, unless specifically recommended for use by the manufacturer.

(viii) See 1910.333(c) for work practices to be used when work is performed on or near electric circuits.

[39 FR 23502, June 27, 1974, as amended at 43 FR 49745, Oct. 24, 1978; 49 FR 5321, Feb. 10, 1984; 55 FR 32014, Aug. 6, 1990]

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Subpart D

Walking - Working Surfaces

1910.27 Fixed Ladders.

(a) "Design requirements" - (1) Design considerations. All ladders, appurtenances, and fastenings shall be designed to meet the following load requirements:

(i)'The minimum design live load shall be a single concentrated load of 200 pounds.

(ii) The number and position of additional concentrated live-load units of 200 pounds each as determined from anticipated usage of the ladder shall be considered in the design.

(iii) The live loads imposed by persons occupying the ladder shall be considered to be concentrated at such points as will cause the maximum stress in the structural member being considered. (iv) The weight of the ladder and attached appurtenances together with the live load shall be considered in the design of rails and fastenings. (2) "Design stresses." Design stresses for wood components of ladders shall not exceed those specified in 1910.25. All wood parts of fixed ladders shall meet the requirements of 1910.25(b).

For fixed ladders consisting of wood side rails and wood rungs or cleats, used at a pitch in the range 75 degrees to 90 degrees, and intended for use by no more than one person per section, single ladders as described in 1910.25(c)(3)(ii) are acceptable.

(b) "Specific features" - (1) "Rungs and cleats." (i) All rungs shall have a minimum diameter of three-fourths inch for metal ladders, except as covered in paragraph (b)(7)(i) of this section and a minimum diameter of 1 1/8 inches for wood ladders.

(ii) The distance between rungs, cleats, and steps shall not exceed 11 inches and shall be uniform throughout the length of the ladder,

(iii) The minimum clear length of rungs or cleats shall be 16 inches.

(iv) Rungs, cleats, and steps shall be free of splinters, sharp edges, burrs, or projections which may be a hazard(s) The rungs of an individual-rung ladder shall be so designed that the foot cannot slide off the end.

(2) "Side rails," Side rails which might be used as a climbing aid shall be of such cross sections as to afford adequate gripping surface without sharp edges, splinters, or burrs.

(3) "Fastenings." Fastenings shall be an integral part of fixed ladder design.
(4) "Splices." All splices made by whatever means shall meet design requirements as noted in paragraph (a) of this section. All splices and connections shall have smooth transition with original members and with no sharp or extensive projections.

(5) "Electrolytic action." Adequate means shall be employed to protect dissimilar metals from electrolytic action when such metals are joined.

(6) "Welding. All welding shall be in accordance with the "Code for Welding in Building Construction" (AWSDI.0-1966).

(7) "Protection from deterioration." (i) Metal ladders and appurtenances shall be painted or otherwise treated to resist corrosion and rusting when location demands.
Ladders formed by individual metal rungs imbedded in concrete, which serve as access to pits and to other areas under floors, are frequently located in an atmosphere that causes corrosion and rusting. To increase rung life in such atmosphere, individual metal rungs shall have a minimum diameter of I inch or shall be painted or otherwise treated to resist corrosion and rusting.

(ii) Wood ladders, when used under conditions where decay may occur, shall be treated with a non-irritating preservative, and the details shall be such as to prevent or minimize the accumulation of water on wood parts.

(iii) When different types of materials are used in the construction of a ladder, the materials used shall be so treated as to have no deleterious effect one upon the other.

(c) "Clearance" - (1) "Climbing side." On fixed ladders, the perpendicular distance from the centerline of the rungs to the nearest permanent object on the climbing side of the ladder shall be 36 inches for a pitch of 76 degrees, and 30 inches for a pitch of 90 degrees (fig. D-2 of this section), with minimum clearances for intermediate pitches varying between these two limits in proportion to the slope, except as provided in subparagraphs (3) and (5) of this paragraph.

(2) "Ladders without cages or wells-" A clear width of at least 15 inches shall be provided each way from the centerline of the ladder in the climbing space, except when cages or wells are necessary.

(3) "Ladders with cages or baskets." Ladders equipped with cage or basket are excepted from the provisions of subparagraphs (1) and (2) of this paragraph, but shall conform to the provisions of paragraph (d)(1)(v) of this section. Fixed ladders in smooth-walled wells are excepted from the provisions of subparagraph (1) of this paragraph, but shall conform to the provisions of paragraph (d)(i)(vi) of this section.

(4) "Clearance in back of ladder." The distance from the centerline of

rungs, cleats, or steps to the nearest permanent object in back of the ladder shall be not less than 7 inches, except that when unavoidable obstructions are encountered, minimum clearances as shown in figure D-3 shall be provided.

(5) "Clearance in back of grab bar." The distance from the centerline of the grab bar to the nearest permanent object in back of the grab bars shall be not less than 4 inches. Grab bars shall not protrude on the climbing side beyond the rungs of the ladder which they serve.

(6) "Step-across distance." The step-across distance from the nearest
edge of ladder to the nearest edge of equipment or structure shall be not
more than 12 inches, or less than 2 1/2 inches (fig. D-4).

(7) "Hatch cover." Counterweighted hatch covers shall open a minimum of 60 degrees from the horizontal. The distance from the centerline of rungs or cleats to the edge of the hatch opening on the climbing side shall be not less than 24 inches for offset wells or 30 inches for straight wells. 'there shall be not protruding potential hazards within 24 inches of the centerline of rungs or cleats; any such hazards within 30 inches of the centerline of the rungs or cleats shall be fitted with deflector plates placed at an angle of 60 degrees from the horizontal as indicated in figure D-5. The relationship of a fixed ladder to an acceptable counterweighted hatch cover is illustrated in figure D-6.

(d) "Special requirements" - (1) "Cages or wells." (i) Cages or wells (except on chimney ladders) shall be built, as shown on the applicable drawings, covered in detail in figures D-7, D-8, and D-9, or of equivalent construction.

(ii) Cages or wells (except as provided in subparagraph (5) of this paragraph) conforming to the dimensions shown in figures D-7, D-8, and D-9 shall be provided on ladders of more than 20 feet to a maximum unbroken length of 30 feet.
the landing laterally served by the ladder. Where access to the landing is through the ladder, the same rung spacing as used on the ladder shall be
used from the landing platform to the first rung below the landing.

(iii) Cages shall extend a minimum of 42 inches above the top of landing, unless other acceptable protection is provided.

(iv) Cages shall extend down the ladder to a point not less than 7 feet nor more than 8 feet above the base of the ladder, with bottom flared not less than 4 inches, or portion of cage opposite ladder shall be carried to the base.

(v) Cages shall not extend less than 27 nor more than 28 inches from the centerline of the rungs of the ladder. Cage shall not be less than 27 inches in width. The inside shall be clear of projections.

(vi) Vertical bars shall be located at a maximum spacing of 40 degrees around the circumference of the cage; this will give a maximum spacing of approximately 9 1/2 inches, center to center.

(vi) Ladder wells shall have a clear width of at least 15 inches measured each way from the centerline of the ladder. Smooth-walled wells shall be a minimum of 27 inches from the centerline of rungs to the well wall on the climbing side of the ladder. Where other obstructions on the climbing side of the ladder exist, there shall be a minimum of 30 inches from the centerline of the rungs.

(2) "Landing platforms." When ladders are used to ascend to heights exceeding 20 feet (except on chimneys), landing platforms shall be 'added for each 30 feet of height or fraction thereof, except that, where no cage, well, or ladder safety device is provided, landing platforms shall be provided for each 20 feet of height or fraction thereof Each ladder section shall be offset from adjacent sections. Where installation conditions (even for a short, unbroken length) require that adjacent sections be offset, landing platforms shall be provided at each offset

(i) Where a man has to step a distance greater than 12 inches from the centerline of the rung of a ladder to the nearest edge of structure or equipment, a landing platform shall be provided. The minimum step-across distance shall be 2 1/2 inches.

(ii) All landing platforms shall be equipped with standard railings and toeboards, so arranged as to give safe access to the ladder. Platforms shall be not less than 24 inches in width and 30 inches in length.

(iii) One rung of any section of ladder shall be located at the level of

(3) "Ladder extensions." The side rails of through or side-step ladder extensions shall extend 3 1/2 feet above parapets and landings. For through ladder extensions, the rungs shall be omitted from the extension and shall have not less than 18 nor more than 24 inches clearance between 'Is. For side-step or offset fixed ladder sections, at landings, the side rails and rungs shall be carried to the next regular rung beyond or above the 3 1/2 feet minimum (fig. D- 10).

(4) "Grab bars." Grab bars shall be spaced by a continuation of the rung spacing when they are located in the horizontal position. Vertical grab bars shall have the same spacing as the ladder side rails. Grab-bar diameters shall be the equivalent of the round-rung diameters.

(1) "Ladder safety devices." Ladder safety devices may be used on tower, water tank, and chimney ladders over 20 feet in unbroken length in lieu of cage protection. No landing platform is required in these cases. All ladder safety devices such as those that incorporate lifebelts, friction brakes, and sliding attachments shall meet the design requirements of the ladders which they serve.

(e) "Pitch" - (1) "Preferred pitch." The preferred pitch of fixed ladders shall be considered to come in the range of 75 degrees and 90 degrees with the horizontal.

(2) "Substandard pitch." Fixed ladders shall be considered as substandard if they are installed within the substandard pitch range of 60 and 75 degrees with the horizontal. Substandard fixed ladders are permitted only where it is found necessary to meet conditions of installation. This substandard pitch range shall be considered as a critical range to be avoided, if possible.

(3) "Scope of coverage in this section." This section covers only fixed ladders within the pitch range of 60 degrees and 90 degrees with the horizontal.

(4) "Pitch greater than 90 degrees." Ladders having a pitch in excess of 90 degrees with the horizontal are prohibited.

(f) "Maintenance." All ladders shall be maintained in a safe condition. All ladders shall I be inspected regularly, with the intervals between inspections being determined by use and exposure.

29 CFR 1910

Subpart D

Walking - Working Surfaces

1910.30 Other Working Surfaces.

(a) "Dockboards (bridge plates)." (1) Portable and powered dockboards shall be strong enough to carry the load imposed on them.

(2) Portable dockboards shall be secured in position, either by being anchored or equipped with devices which will prevent their slipping.

(3) Powered dockboards shall be designed and constructed in accordance with Commercial Standard CS202-56 (1961) "Industrial Lifts and Hinged Loading Ramps" published by the U.S. Department of Commerce.

(4) Handholds, or other effective means, shall be provided on portable dockboards to permit safe handling.

(5) Positive protection shall be provided to prevent railroad cars from being moved while dockboards or bridge plates are in position.

NOTE: Dock Door Areas: Refer to 29 CFR 1910 . 23 (b) & (c)
Open Dock Doors 4 feet or more shall be guarded.

(b) "Forging machine area." (1) Machines shall be so located as to give,

(i) enough clearance between machines so that the movement of one operator will not interfere with the work of another,

(ii) ample room for cleaning machines and handling the work, including material and scrap. The arrangement of machines shall be such that operators will not stand in aisles.

(2) Aisles shall be provided of sufficient width to permit the free movement of employees bringing and removing material. This aisle space s to be independent of working and storage space.

(3) Wood platforms used on the floor in front of machines shall be substantially constructed.

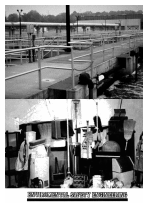
(c) "Veneer machinery." (1) Sides of steam vats shall extend to a height of not less than 36 inches above the floor, working platform, or ground.

(2) Large steam vats divided into sections shall be provided with substantial walkways between sections. Each walkway shall be provided with a standard handrail on each exposed side. These handrails may be removable, if necessary.

(3) Covers shall be removed only from that portion of steaming vats on which men are working and a portable railing shall be placed at this point to protect the operators.

(4) Workmen shall not ride or step on logs in steam vats.

Definitions:
Pages 2-13





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Open Sided Floors, Platforms & Runways:

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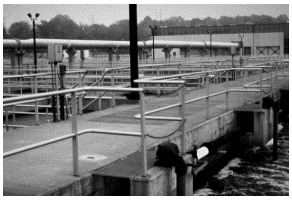

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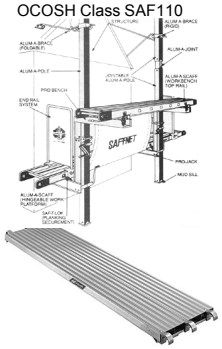
Scaffolding:

OCOSH Class SAF110



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Other Working Surfaces:

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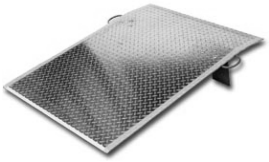

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WALKING – WORKING SURFACES

29 CFR 1910
Subpart D

1910.21 DEFINITIONS

- FLOOR HOLE – an opening measuring less than 12 inches but more than 1 inch in its least dimensions
- FLOOR OPENING – an opening measuring 12 inches or more in its least dimension
  i.e. stair opening, hatchway, manhole

1910.21 DEFINITIONS

- HANDRAIL – a single bar or pipe supported on brackets from a wall to furnish persons with a handhold
- WALL HOLE – an opening less than 30 inches but more than 1 inch high, of unrestricted width

1910.22 GENERAL REQUIREMENTS

(a) Housekeeping

(1) All places of employment, passageways, storerooms, and service rooms shall be kept clean and orderly and in a sanitary condition

(2) The floor of every workroom shall be maintained in a clean and dry condition. When wet processes are used, drainage shall be maintained.

1910.22 GENERAL REQUIREMENTS

(b) Aisles and Passageways

(1) Where mechanical handling equipment (fork trucks) is used, sufficient safe clearances shall be allowed for aisles.

(2) Permanent aisles and passageways shall be appropriately marked.

* ANSI Z 53.1 Aisle Markings
* 1910.176 PIT

1910.22 GENERAL REQUIREMENTS

(d) Floor Loading Protection

(1) Overhead storage areas, mezzanines, etc. need posted sign identifying the maximum weight per square foot of the space.

1910.23 GUARDING FLOOR/WALL OPENINGS AND HOLES

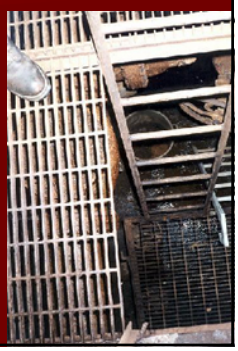
(a) Protection for Floor Openings

(1) Every stairway floor opening shall be guarded by a standard railing, provided on all exposed sides (except at entrance to stairway).

1910.23 GUARDING FLOOR/WALL OPENINGS AND HOLES

(a)(2) Every ladder, floor opening or platform shall be guarded by a standard railing with standard toe board on all exposed sides (except at entrance to opening).

* Industry – 4 ft *
Construction – 6 ft



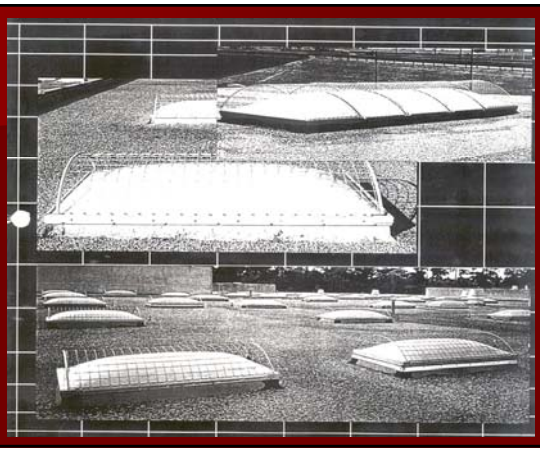
1910.23 GUARDING FLOOR/WALL OPENINGS AND HOLES

(a)(3) Every hatchway and chute floor opening shall be guarded by one of the following:

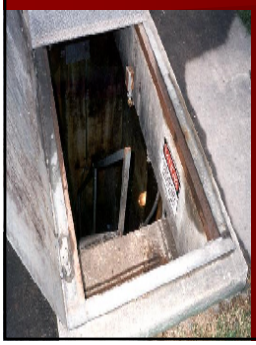
(i) Hinged Floor Opening Cover

(ii) Removable Railing & Toe Board

(4) Every skylight floor opening and hole shall be guarded by a standard skylight screen or fixed standard railing on all exposed sides



1910.23 GUARDING FLOOR/WALL OPENINGS AND HOLES



(5) Every pit and trapdoor shall be guarded by a floor opening cover. While the cover is not in place the opening shall be constantly attended by someone or protected on all exposed sides by a removable standard railing.

1910.23 GUARDING FLOOR/WALL OPENINGS AND HOLES

(6) Every manhole floor opening (measuring larger than 12 inches) shall be guarded by a standard manhole cover.

(7) Every temporary floor opening shall have standard railings.

1910.23 GUARDING FLOOR/WALL OPENINGS AND HOLES

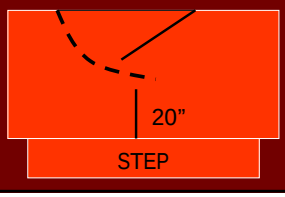
(8) Every floor hole shall be guarded by:

(i) Standard Railing with Standard Toe Board

(ii) Floor Hole Cover

1910.23 GUARDING FLOOR/WALL OPENINGS AND HOLES

(10) Where doors or gates open directly on a stairway, a platform shall be provided and the swing of the door shall not reduce the effective width to less than 20 inches.



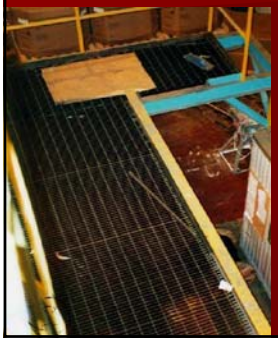
1910.23 GUARDING FLOOR/WALL OPENINGS AND HOLES

(b) Protection for wall openings and holes

(1) Every wall opening from which there is a drop of more than 4 ft shall be guarded

i.e. shipping docks

1910.23 GUARDING FLOOR/WALL OPENINGS AND HOLES



(c) Protection of open sided floors, platforms, and runways

(1) Every open sided floor or platform 4 ft or more above the floor shall be guarded by a standard railing

1910.23 GUARDING FLOOR/WALL OPENINGS AND HOLES

(c)(1) A toe board shall be provided whenever:

(i) persons can pass under

(ii) there is moving machinery

(iii) hazard of falling materials

(2) Every runway shall be guarded by a standard railing

1910.23 GUARDING FLOOR/WALL OPENINGS AND HOLES

(3) Regardless of height, open sided floors, walkways, platforms **above or adjacent to dangerous equipment, galvanizing tanks, degreasing units** and similar hazards shall be guarded with railing and toe board

1910.23 GUARDING FLOOR/WALL OPENINGS AND HOLES

(d) Stairway railing and guards

(1) Every flight of stairs having four or more risers shall be equipped with standard railings

(i) stairways less than 44 inches wide -having both sides enclosed at least one handrail on the right side descending

(ii) having one side open – at least one stair railing on open side

1910.23 GUARDING FLOOR/WALL OPENINGS AND HOLES

(iii) having both sides open – one stair railing on each side

(iv) Stairways more than 44 inches wide but less than 88 inches wide – one handrail on each enclosed side and one stair railing on each open side

(v) Stairways more than 88 inches wide – one handrail on each enclosed side , one stair railing on each open side and one intermediate stair railing

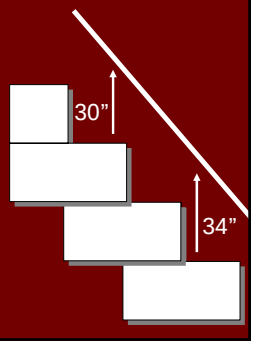
1910.23 GUARDING FLOOR/WALL OPENINGS AND HOLES

(e) Railings, toe boards and cover specifications

(1) Standard railing consists of top rail, intermediate rail and posts and shall have a vertical height of 42 inches. Top rail (42") shall be smooth-surfaced. Intermediate rail (21") shall be approximately halfway between the top rail and the floor.

1910.23 GUARDING FLOOR/WALL OPENINGS AND HOLES

(e)(2) Stair railing shall be of construction similar to standard railing. The vertical height shall be not more than 34 inches nor less than 30 inches from upper surface of top rail.



1910.23 GUARDING FLOOR/WALL OPENINGS AND HOLES

(e)(6) All handrails shall have a clearance of not less than 3 inches between the handrail and any other object.

(8) Skylight screens shall be of such construction and mounting that they are capable of withstanding a load of at least 200 pounds.

1910.24 FIXED INDUSTRIAL STAIRS

(f) Stair treads – rise height and tread width shall be uniform throughout any flight of stairs.

(h)(i) Vertical Clearance – vertical clearance above any stair tread to an overhead obstruction shall be at least 7 feet.

1910.25 PORTABLE WOOD LADDERS

(b)(1) Requirements of wood parts

(i) All wood parts shall be free from sharp edges and splinters

(c)(2) Portable stepladders – stepladders longer than 20 feet shall not be supplied.

Three types of ladders
TYPE IA – Industrial
TYPE II – Commercial
TYPE III – Household

1910.25 PORTABLE WOOD LADDERS

(c)(2)(i) General Requirements

(b) A uniform step spacing, not more than 12 inches, shall be employed.

(f) Each ladder shall have a metal spreader which holds the front and back sections in the open position.

1910.25 PORTABLE LADDERS

(d) Care and Use of Ladders

(1)(i) Ladders shall be maintained in good condition at all times.

(iv) Safety feet shall be kept in good condition.

(x) Ladders shall be inspected frequently and those which have developed defects shall be withdrawn from service.

(xi) Rungs shall be free of grease and oil.

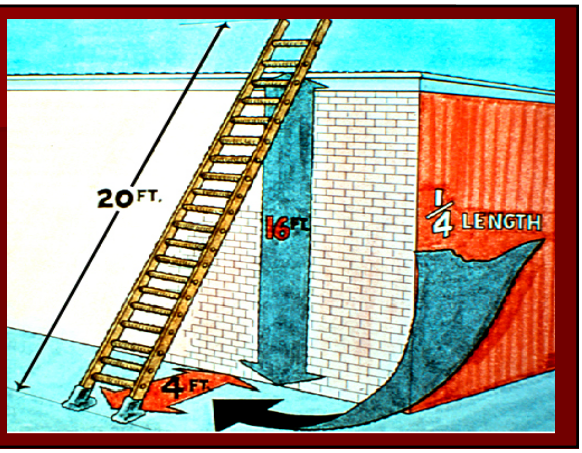
1910.25 PORTABLE LADDERS

(d)(2) Use

(i) Used at a 4:1 pitch, ladders shall be lashed or held in position. Ladders shall not be used in a horizontal position.

(ii) Ladders should not be used by more than one man at a time.

(iii) Portable ladders shall be so placed that the side rails have secure footing.



1910.25 PORTABLE LADDERS

(iv) Ladders shall not be placed in front of door opening, unless the door is blocked, locked or guarded.

(v) Ladders shall not be placed on boxes, barrels, or other bases to obtain additional height.

(vii) Ladders with broken or missing steps, rungs, cleats or side rails shall not be used.

1910.25 PORTABLE LADDERS

(ix) Ladders shall not be spliced together.

(xi) Ladders shall not be used as braces or other than their intended purpose.

(xii) Tops of stepladders shall not be used as steps.

1910.25 PORTABLE LADDERS

(xiii) On two section extension ladders the minimum overlap shall be

Size of Ladder (ft)	Overlap (ft)
Up to & including 36	3
Over 36 up to & including 48	4
Over 48 up to and including 60	5

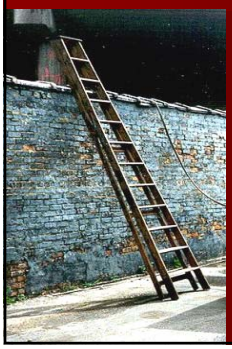
1910.25 PORTABLE LADDERS

(xv) Ladder used to gain access to a roof shall extend at least 3 feet above the roofline.

(xix) The user should equip all portable rung ladders with non-slip bases if a slipping hazard is present.

(xx) The bracing on the back legs of a step ladder are not for climbing.

1910.25 PORTABLE LADDERS



* Step ladders can not be used as a straight sided ladder

1910.333

(c)(7) Portable ladders shall have nonconductive side rails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1910.27 FIXED LADDERS

(c)(4) Clearance in back of ladder – the distance from the centerline of the rungs to the nearest permanent object in back of the ladder shall be not less than 7 inches.

(d) Special Requirements

(1)(i) Cages shall be provided on ladders of more than 20 feet.

1910.27 FIXED LADDERS

(1)(ii) Cages shall extend a minimum of 42 inches above the top of the landing.

(iv) Cages shall extend down the ladder to a point not less than 7 feet nor more than 8 feet above the base of the ladder.

1910.27 FIXED LADDERS

(d)(3) Ladder extensions – the side rails of through or side step ladder extensions shall extend 3 ½ feet above landings.

(4) Ladder safety devices – ladder safety devices may be used on ladders over 20 feet in unbroken length in lieu of cages.

1910.30 OTHER WORKING SURFACES

(a) Dockboards (bridge plates)

(1) Dockboards shall be strong enough to carry the load imposed on them.

(2) Dockboards shall be secured in position.

(3) Powered dockboards shall be designed and constructed in accordance with CS202-56 (1961)

(4) Positive protection shall be provided to prevent railroad cars from being moved.